

Final Report

For project:

Lake Erie LiDAR

Prepared for:

**Ontario Ministry of Natural Resources and Forestry –
Provincial Mapping Unit
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Introduction

The Ontario Ministry of Natural Resources & Forestry contracted Airborne Imaging, A Clean Harbors Company, in the fall of 2016 to acquire and deliver digital elevation data derived from airborne LiDAR (Light Detection and Ranging) to cover three regions in Ontario: Cochrane, Peterborough and Lake Erie Watershed.

This report covers the three seasons required to collect data over the Lake Erie project (spring 2017, fall 2017 and spring 2018). It focuses on LiDAR acquisition details, such as flight parameters, project control, ground truthing results, data processing technique and deliverables.

Because of the size of the project and the short leaf-off/snow-off periods, the data was acquired in three seasons: Spring 2017, Fall 2017 and Spring 2018.

The original contracted area for Lake Erie was 17,020 km². In August 2017, the Upper Grand River watershed was added bringing the total area (including a 100m buffer) to 22,726 km².

Project Schedule & Personnel

During the periods Airborne Imaging was collecting Lidar data, one Lidar Operator / Surveyor was tasked with collecting ground truth points on days when the weather didn't allow Lidar data collection.

A typical Lidar acquisition crew consisted of one Project Manager, one Lidar Operator and one Pilot. Due to crew rotation, various individuals were assigned to this project. Below is a list of personnel:

Project Manager

Allyson Fox
Tim Willms
Gerry Bouma

Lidar Operator

Allyson Fox
Fabian Salagubas
Trace Trithardt
Don Tarr
John Anderson
Roger Rutledge
Andrew Blair
Chris Johnson
Gord Westergard

Pilot

Pauline Seiter
Alex Murray
Farooq Umer
Daniel Kockel
Thomas Sornasse
Owen Kamerman
Daniel Thibeault
Sarah Bouzid
Benoit Kaepeli
Alex Lavalier

For most of the acquisition periods, two aircrafts were dedicated to data acquisition. It was mutually agreed between Airborne Imaging and the Ontario government as to when the leaf-off and snow-off start and end date would be. Weather was unfortunately less than optimal, especially in the fall period.

LiDAR System & Flight Parameters

Two different aircraft providers provided the Piper Navajo aircrafts for this project. KASI Aviation, from Montreal had the following aircrafts assigned off and on to this project: C-GKSI, C-GMEC and C-GKSX. Aries Aviation from Calgary had aircraft C-FFRY assigned to this project.

There were five different LiDAR systems utilized on this project, two Leica ALS70-HP (serial numbers 7179 & 7207), one Riegl LMS Q-1560 (serial number 54) and two Riegl VQ-1560i (serial numbers 38 & 93).

See Appendix A for a table of the lifts with their flight parameters.

Project Control

A full geodetic network was observed locally to support the Lidar acquisition. The existing control used consisted of twenty one NRCan Cannet stations, one NGS CORS station and eight NRCan passive stations. Airborne Imaging established six new stations to support our airborne operations during Lidar acquisition.

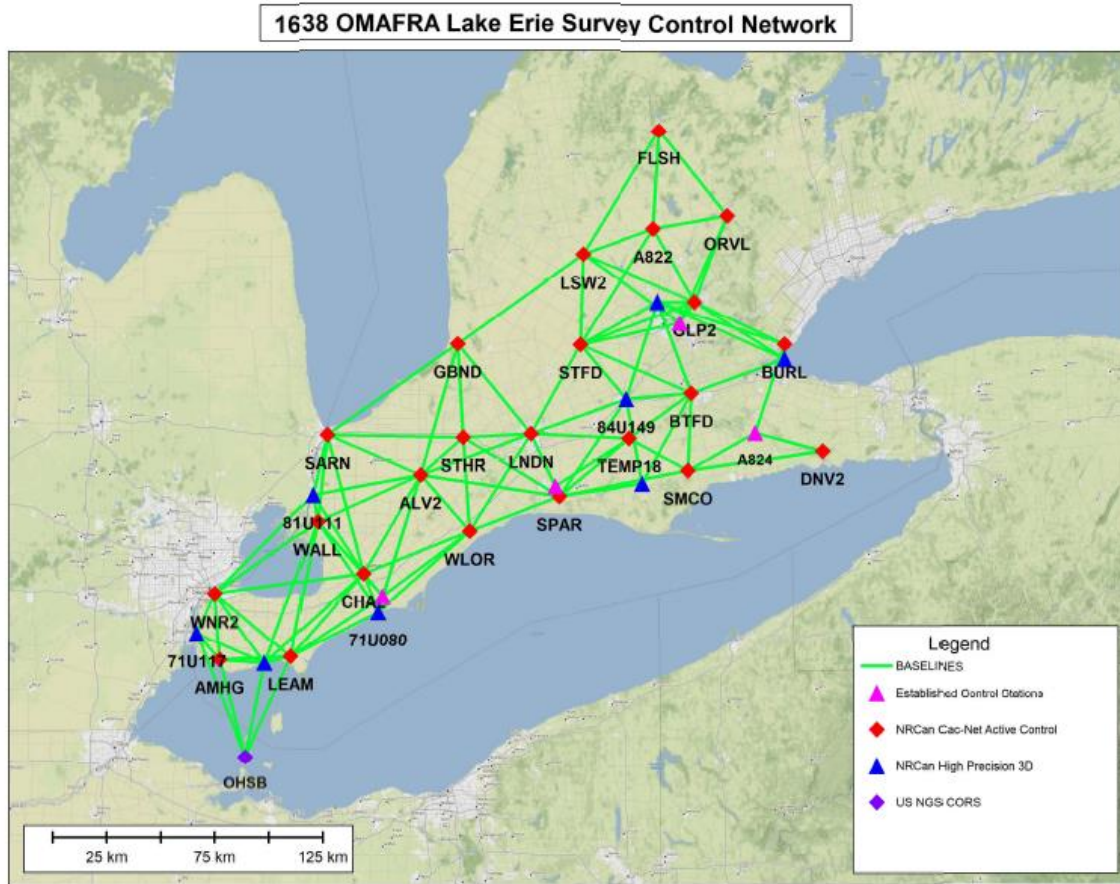
During the fully constrained least-squares adjustment, eighteen Cannet active stations were held fixed in three dimension (all except stations AMHG, LEAM and WNR2).

The control network and therefore all subsequent Lidar data are based on the Nad83 CSRS (epoch 2010.0) horizontal datum and the CGVD2013 vertical datum (CGG2013 undulation model). See summary table below for the points in our geodetic network.

Lake Erie Control Listing

Station Name	Unique Id	Type	Latitude	Longitude	Easting UTM17	Northing UTM17	H-Ellips (m)	Undul CGG2013	H-Orthom (m)
71U080	71U080	Passive	42 14 49.59927	-82 05 58.54490	409286.726	4677798.536	162.815	-34.452	197.267
71U117	71U117	Passive	42 08 39.34129	-83 06 50.10586	325322.279	4667956.329	140.957	-34.290	175.247
81U111	81U111	Passive	42 43 46.11194	-82 28 37.51059	379077.215	4731831.984	142.011	-34.447	176.457
84U149	84U149	Passive	43 08 19.64867	-80 42 00.02628	524396.810	4776271.193	263.543	-35.166	298.710
883066	883066	Passive	42 47 05.69418	-80 36 40.80498	531789.760	4737003.668	195.411	-35.273	230.683
A535	A535	Airborne	43 27 18.73960	-80 23 19.24400	549458.419	4811548.082	275.727	-35.369	311.095
A792	A792	Airborne	42 18 46.73734	-82 04 37.03279	411247.165	4685088.820	160.987	-34.459	195.446
A793	A793	Airborne	42 46 34.46818	-81 06 18.30494	491403.704	4735972.599	199.213	-35.131	234.344
A822	A822	Airborne	43 50 47.86462	-80 32 23.15891	536993.757	4854941.424	425.686	-34.969	460.655
A824	A824	Airborne	42 59 33.92521	-79 58 00.67119	584220.319	4760528.290	168.898	-35.437	204.335
ALV2	CALV	Cannet	42 49 09.89973	-81 52 09.15298	428944.857	4741127.983	194.873	-34.607	229.481
AMHG	CAMH	Cannet	42 02 12.05169	-82 59 05.23667	335715.563	4655754.655	159.762	-34.587	194.349
BTFD	CBTF	Cannet	43 09 37.42146	-80 19 45.02436	554535.610	4778845.011	215.712	-35.455	251.167
BURL	CBUL	Cannet	43 21 40.23637	-79 47 28.50816	597944.429	4801633.542	87.893	-35.856	123.749
BURLINGTON	M053004	Passive	43 17 58.42096	-79 47 36.67798	597859.428	4794788.108	40.094	-35.825	75.919
CHA2	CCH2	Cannet	42 24 21.82073	-82 11 08.73419	402424.377	4695543.311	158.655	-34.477	193.132
DNV2	CDN2	Cannet	42 54 46.35547	-79 35 03.43328	615556.210	4752112.112	152.033	-35.281	187.313
FLSH	CFLS	Cannet	44 15 31.37887	-80 30 17.01015	539535.289	4900727.805	452.800	-35.033	487.834
GBND	CGBN	Cannet	43 22 00.57951	-81 39 56.66293	446060.504	4801766.879	187.002	-34.785	221.787
GLP2	CGLP	Cannet	43 32 28.50946	-80 18 21.64607	556066.788	4821156.748	315.124	-35.410	350.534
KINGSVILLE	M053006	Passive	42 01 38.54132	-82 44 03.76751	356422.046	4654270.473	140.101	-34.661	174.762
LEAM	CLEA	Cannet	42 03 21.79101	-82 35 18.98585	368549.097	4657220.630	160.062	-34.630	194.692
LNDN	CLND	Cannet	42 59 39.08802	-81 14 38.90110	480098.738	4760198.644	218.567	-34.940	253.507
LSW2	CLS2	Cannet	43 44 32.73890	-80 56 46.44816	504329.117	4843266.880	359.642	-34.838	394.480
ORVL	CORV	Cannet	43 53 52.49044	-80 06 44.11670	571296.233	4860917.468	428.199	-35.346	463.545
PIER 2	843025	Passive	43 32 32.82456	-80 31 05.45578	538924.962	4821168.703	301.975	-35.196	337.171
SARN	CSAR	Cannet	42 58 53.51909	-82 24 10.41417	385617.454	4759718.874	159.112	-34.362	193.474
SMCO	CSMC	Cannet	42 50 17.50056	-80 21 02.37812	553065.339	4743051.295	203.593	-35.331	238.924
South Bass Island	OHSB	CORS	41 38 11.21610	-82 49 47.18034	347600.041	4611029.954	148.329	-35.062	183.391
SPAR	CSPA	Cannet	42 44 01.37594	-81 04 51.83255	493364.097	4731248.236	206.640	-35.154	241.795
STFD	CSTD	Cannet	43 21 56.41430	-80 57 46.36284	503007.702	4801423.870	332.910	-34.875	367.786
STHR	CST3	Cannet	42 58 41.32035	-81 37 45.57310	448686.435	4758579.908	209.453	-34.751	244.203
TEMP18	TEMP18	Airborne	42 58 29.68817	-80 40 57.84914	525870.203	4758077.802	239.114	-35.212	274.326
WALL	CWAL	Cannet	42 37 08.25849	-82 26 49.33850	381327.013	4719517.272	147.762	-34.411	182.172
WLOR	CWLO	Cannet	42 35 17.34193	-81 35 16.94003	451750.971	4715248.822	185.655	-34.831	220.486
WNR2	CWN2	Cannet	42 18 30.71918	-83 01 00.48586	333779.277	4686002.856	158.714	-34.054	192.768

Below is an overview map of the geodetic network.



See Appendix D at the end of this report for the Full Control Report with listings of:

- a.) Final Adjusted Coordinates
- b.) Traverse Overview
- c.) Traverse Report
- d.) Minimally Constrained Network Adjustment
- e.) Fully Constrained Network Adjustment
- f.) NRCan Can-Net Control Station Reports
- g.) NRCan Passive Control Station Reports

Check Points

Control check points were surveyed from different methods to use as vertical check and accuracy assessment. The kinematic method was used for calibration purposes, Fast Static and RTK methods for Non-Vegetated Vertical Accuracy Assessment (NVA) and the RTK method in vegetated areas for the Vegetated Vertical Accuracy Assessment (VVA).

Kinematic GPS

The first method called kinematic are profiles surveyed on open roads from a truck-mounted GPS receiver while driving. The post-processed kinematic coordinates, collected at an interval of one second are derived from a base station that is part of our geodetic network.

Whenever possible, we try to select roads that are perpendicular to the flight line azimuth so the control points intersect as many Lidar strips as possible. Kinematic points were collected along the roads following the green dots on the map below.

The output coordinates are analyzed and filtered to ensure only very reliable positions are kept. All points collected while moving slower than 2 meters per second are rejected. This removes all points when the truck was stationary that could skew the statistics.

The following points are also rejected:

- Points with a Quality Level worse than 1.
- Points with a forward/reverse vertical separation worse than 3 cm.
- Points with less than two solutions (forward & reverse).
- Points with a standard deviation worse than 2σ .

Many sections of road were surveyed throughout the project giving us more than 40,000 surveyed points on the road. We estimate that the vertical accuracy of these points is better than 5 cm.

During the calibration of the Lidar strips, the Lidar strips are matched vertically to these reliable kinematic points. These points are not used for the vertical accuracy assessment of the Lidar point cloud, but rather just for calibration monitoring and shifting.

Fast Static GPS

In order to meet the recommended ASPRS minimum number of points for a 22,726 square kilometer project, fast static and RTK points were surveyed in areas distributed throughout the project.

The second method called Fast Static are individual points surveyed on open roads from a truck-mounted GPS receiver while staying stationary during a minimum of five minutes. The post-processed static coordinates are derived from a base station that is part of our geodetic network.

371 points were surveyed on the Lake Erie project.

See the green circles on the map below.

These points are used just for the vertical accuracy assessment of the Lidar point cloud, and were not used to determine any vertical shift applied to the point cloud.

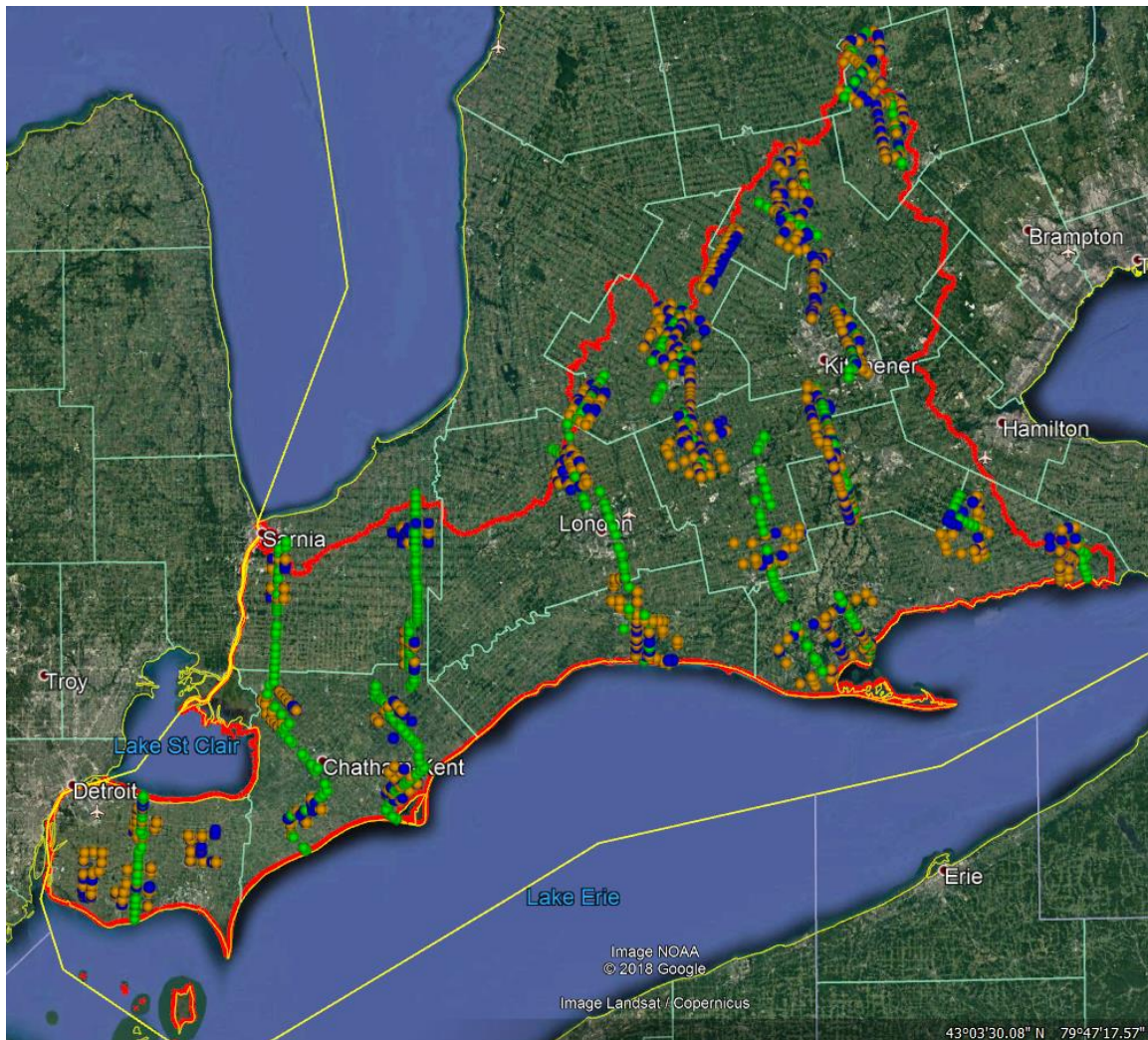
Real-time Kinematic GPS (RTK)

The third method called Real-Time Kinematic are individual points surveyed on open surfaces from a pole-mounted GPS receiver, surveyed while walking to various locations. A nearby base station broadcasted via radio modem the differential corrections to the roving GPS receiver. The surveyor held the pole and antenna in a fixed position for a period necessary for the differential corrections from the base station to indicate that a fixed solution was acquired. The static period usually last about six epochs (6 seconds). A full loss of lock on the satellites was intentionally induced by turning the antenna upside down and the points surveyed again as a check.

Another 813 points were surveyed in open areas distributed throughout the project. These points are used to assess the Non-Vegetated vertical Accuracy (NVA). See the orange circles on the map below.

These points are used just for the vertical accuracy assessment of the Lidar point cloud, and were not used to determine any vertical shift applied to the point cloud.

The same RTK method was used to survey points in vegetated areas like tall grass, crops, brush, weeds and different tree type covers. These points are used to assess the Vegetated Vertical Accuracy (VVA). 659 VVA points were surveyed in the same general areas as the NVA points. See the blue circles on the map below.



Red = project outline

Green = Fast Static, also corresponds to location of Kinematic ground truth runs

Orange = RTK (NVA)

Blue = RTK (VVA)

Field Calibration of Lidar Strips

Three airports were used as base of operations for this project: Chatham-Kent, St-Thomas and Kitchener-Waterloo. Calibration sites have been established near each of the three airports. The calibration sites consists of a primary control station, and surveyed kinematic points on a road adjacent to the airport. Approximately 2km long strips of Lidar data are then flown with two passes in opposing directions during each mission. The flight lines are orientated perpendicular and centered over the kinematic points and nearby buildings. They are flown once at the start of mission, and a second time at the end of mission.

Calibration of raw LiDAR data for each flight mission is essential to meet the required accuracy. Airborne Imaging spends the extra time and effort to fly two calibration passes at the beginning and two more at the end of each mission. As the field Project Manager produces the point cloud in the field, he/she uses these calibration passes to calibrate the point cloud to the best of his ability. The boresight values between the mounted sensors are solved and monitored twice per mission. The inertial errors associated with aircraft sensor roll, pitch, and heading are normally stable and consistent. For the most part the changes between calibrations are minimal but monitoring it within missions and between missions gives us a better control on the systems' behaviors.

A final, more in depth calibration takes also place later when the field produced point cloud arrives in the office in Calgary.

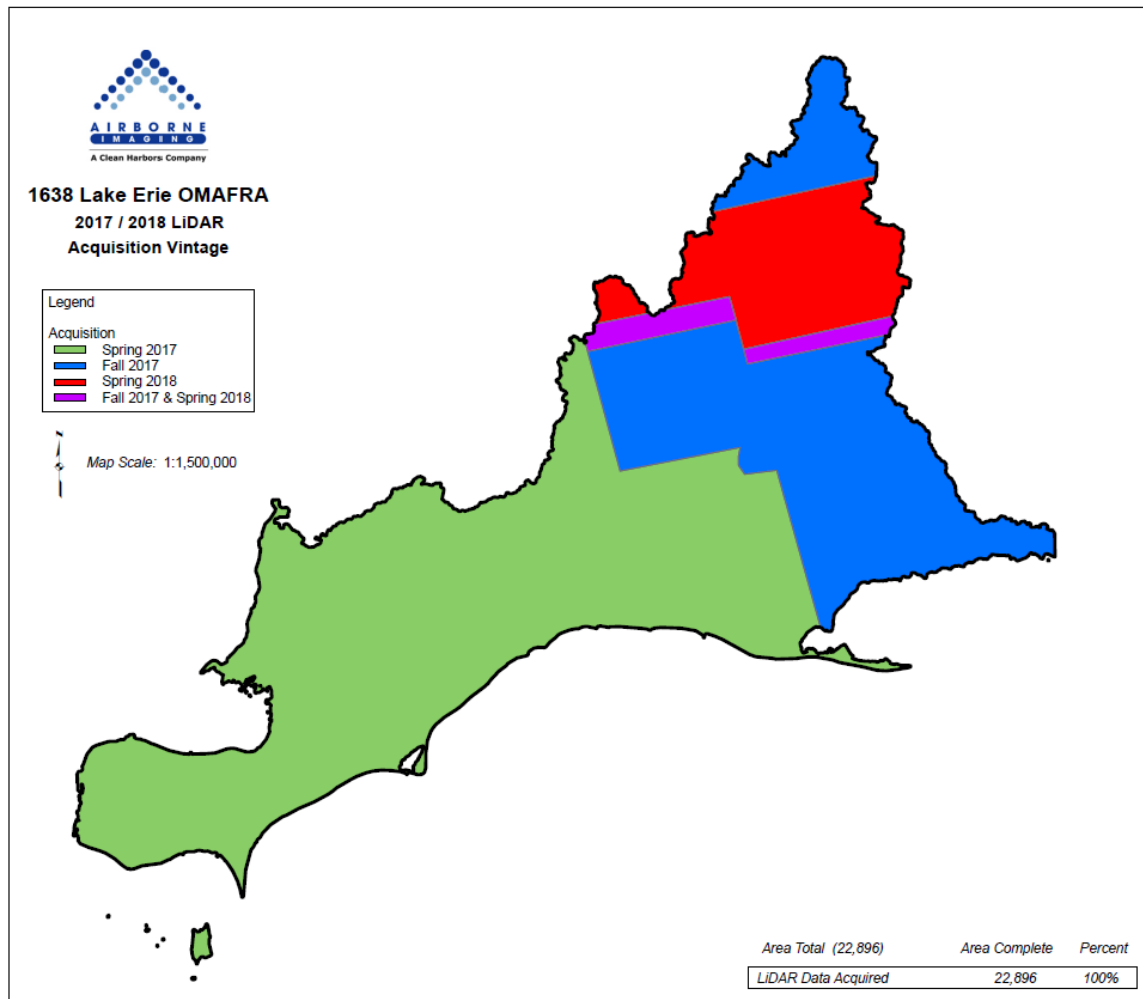
Lidar Acquisition

As mentioned in the Project Schedule and Personnel section above, the Lidar acquisition was done in three leaf-off/snow-off seasons: Spring 2017, Fall 2017 and Spring 2018.

See table below for a summary of acquisition dates.

Season	Acquisition Start	Acquisition End	# of missions flown
Spring 2017	March 11, 2017	May 20, 2017	38
Fall 2017	October 20, 2017	December 6, 2017	23
Spring 2018	March 20, 2018	May 8, 2018	13

See map below for the areas covered during the three seasons.



See Appendix B for the Daily Lidar Field Acquisition Report.
For the flight logs of the 74 missions, see .pdf files in the “Flightlogs” folder on the final deliverables hard drive.

LiDAR Data Processing

Tiling

The Lake Erie project falls entirely within UTM zone 17. The point cloud is therefore tiled into 1000m X 1000m tiles based on the UTM17 projection. The extents fall on the even integer and the tiles named according to the lower left Easting and Northing (truncated). The software used for point cloud manipulation is TerraSolid's TerraScan/TerraModeler applications. At this stage, the files are stored in .las version 1.2.

Mission (lift) and flight line naming convention

Airborne Imaging's convention for naming missions (or lifts) is the following:

e.g. 0716288a where

07 is the Lidar system unique identifier. e.g. System serial number ending with 07.
16 is the collection year (2016)
288 is the Julian day of acquisition (sequential day of the year since January 1)
a is the sequential mission or lift of the day (a = 1st mission, b = 2nd mission, ...)

While importing the raw point cloud strips into tiles, the flight line numbers adopted are as follows.

e.g. 071628804 where

The first seven characters are the same as described in the mission folder name above, plus a sequential strip number for that day:

"04" is the fourth strip acquired that day, 05 is the fifth, ...

Note that the Leica ALS70 sensor measures data from two channels on each strip which we separate for calibration and manipulation purposes. The Riegl systems physically have two laser scanners, which are considered two channels.

Because of limitations of the 64bit field to store the strip identifier, we typically add 300 to the Julian day for the second channel.

So for example, from sensor 07, on Julian Day 288, there would be two .las files for strip 04 named: 071628804 and 071658804.

Inside all .las files, the strip number (28804 and 58804) corresponds to the point source ID in the .las files. The Lidar system number is also stored in the .Las files in the "user_data" field.

Calibration

During field processing and after each mission, the point cloud strips from the "calibration passes" are compared to each other to ensure relative accuracy. The outside edges of scan can be compared in open areas to detect vertical differences which would point to roll or scale miss-calibration values. Man-made features such as pitched-roof buildings are also useful to check for horizontal alignment. If the calibration values (angles between the laser sensor and the IMU) are found to have changed from the previous mission, it would show in the repeatability of the measured data sets. Corrective measures would then be taken to fine tune the proper angular values. Once the data fit well together, it is compared to a ground profile to validate the elevations in an absolute accuracy point of view. Statistics and visual graphs of the elevation differences are produced to confirm accuracy requirements. Once the calibration values are obtained, the mission point cloud data is then generated in the field as preliminary calibrated. The point cloud and supporting files are copied to external hard drives and shipped to the processing center in Calgary.

Once the data has arrived in the office, an experienced calibration specialist reviews the field calibration. The strips are imported into tiles and the TerraMatch software is used to assess and improve any flight line separation between passes. Typically, the adjustments are made on the entire mission for roll and pitch. Occasionally, further corrections are required by individual flight lines for roll, pitch and DZ.

Once the flight lines fit well relatively to one another, the unclassified point cloud is compared to the kinematic profiles surveyed on roads. If any vertical biases are observed, an elevation correction (DZ) is applied to the mission.

Intensity normalization

The native intensity values collected generally range between approximately 0 and 1000 for the Leica sensors and between 15000 and 55000 for the Riegl sensors. The native intensity values were then normalized to 16bit. For the Leica, the intensity values were multiplied by 64 and for the Riegl, their values first had 16000 subtracted, then multiplied by 1.5. The resulting intensities range between 0 and 65535.

Point Cloud Classification

Point classification is done with the TerraScan software, using macros that are set-up to measure the angles and distances between points to determine what classification a point should be: ground, non-ground, ... The angle and distance values in the macros can be varied to be more or less aggressive with the classification of points from the unclassified class to ground by varying the incidence angles and estimated distances among neighboring points.

Following the USGS minimum classification scheme, the points are classified in the following classes:

Code	Description
1	Processed, but unclassified
2	Bare earth
7	Low noise
9	Water
10	Ignored ground (near a breakline)
17	Bridge decks
18	High noise

To better understand areas where the classification (mathematical models) did not represent the ground accurately, the points that are classified as bare earth are extracted and turned into viewable TIN and grid surfaces. These surfaces are viewed in conjunction with the point cloud for inspection of areas that appear rough, artificially flattened or cut, no data areas, or have other viewable anomalies. In cleaning up ground points, an effort is concentrated in areas where few ground points have been left in the bare earth model and the ground appears rough or lower and flatter than it may be in reality. The scarcity of ground points may be a result from no penetration through a dense vegetation layer, or too aggressive values with the macro. A manual inspection of these areas plays a major role in resolving any issues or irregularities with the bare earth model. A manual effort is also made to make sure that bridge decks have been classified to class 17. Both Bare Earth and Full Feature grids are created to visually inspect the

data. The Bare Earth grids are produced by using the ground classified points, where the grid is created from the TIN. The Full Feature grids are produced by using all non-noise points and creating a grid surface of the highest elevations within the cell size.

Water Classification & Hydro-Flattening

Once the ground class has reached the final level of classification accuracy, the water delineation process is initiated. The rivers and water bodies are digitized as break lines according to USGS specifications of a minimum of 8000 m² for water bodies and 30 m nominal width for streams and rivers. Ponds and lakes have their elevations set constant to just below ground. Stream and river hydro lines are collected using the downstream method. Once all hydro lines have been collected for an area, the ground points inside the hydro lines are classified to class 9 – Water. The ground points outside of the hydro lines but within 35 cm are classified to class 10 – Ignored ground (near breaklines). Using the TIN of class 2 – Bare earth, the hydro lines are used as constraints to generate the final 50 cm hydro-flattened DEMs in XYZ format, then converted to Erdas .img format with the Global Mapper software.

Deliverables

Raw Point Cloud strips re-construction

Since the missions had to be tiled into manageable file sizes at the calibration stage, the Raw Point Cloud strips had to be re-constructed from the final calibrated and shifted tiles. Using the TerraScan and Lastools software, the strips were re-exported from the tiles, sorted by time and converted to .las version 1.4 with the proper datum information in OGC-WKT format. The strips were then compressed from .las to .laz format.

See below for a table of the folder structure and description of each deliverables.

Folder	Sub-Folder	Content and Description	
LAKEERIE_EPSG2958	DTM	Hydro-flattened 50cm Bare Earth DEMs, 1km X 1km (ERDAS Imagine .img format)	e.g. 1km173240465802017LLAKEERIE.img
	METADATA	Metadata, FGDC compliant (.xml format) for each of the following deliverables: Breaklines DEM Las Project Vertical comparisons between Lidar point cloud TIN surface and kinematic surveyed points (Excel format) Vertical comparisons between Lidar point cloud TIN surface and NVA Fast Static surveyed points (Excel format) Vertical comparisons between Lidar point cloud TIN surface and NVA RTK surveyed points (Excel format) Vertical comparisons between Lidar point cloud TIN surface and VVA RTK surveyed points (Excel format) Vertical comparisons between Lidar point cloud TIN surface and Ground Control surveyed points (Excel format) List of Lifts with flight parameters (Excel format) List of Geodetic control points with coordinates (Excel format) Final Lidar report (Word format) Final Lidar report (PDF format)	LakeErie_Lidar_metadata_Breaklines.xml LakeErie_Lidar_metadata_DEM.xml LakeErie_Lidar_metadata_LAS.xml LakeErie_Lidar_metadata_Project.xml LakeErie_NVA_Kinematic_comparisons_Final.xlsx LakeErie_NVA_FastStatic_comparisons_Final.xlsx LakeErie_NVA_RTK_comparisons_Final.xlsx LakeErie_VVA_RTK_comparisons_Final.xlsx LakeErie_GeodeticPoints_comparisons_Final.xlsx LakeErie_Final_lifts.xlsx LakeErie_ControlStationListing.xlsx LakeErie Lidar Final Report January 2019.doc LakeErie Lidar Final Report January 2019.pdf
	POINTCLOUD	Classified Point Cloud, 1km X 1km (zipped .las v1.4 format)	e.g. 1km173240465802017LLAKEERIE.laz
	PROJECT_POLYGON	Metadata per lift (or missions) with flight parameters, flight line number, ... (ESRI shape format) Hydro break lines (ESRI shape format) Project extent (ESRI shape format) Tile index (ESRI shape format)	e.g. 0717098a_lift_metadata.shp LakeErie_Hydro_Breaklines_Final_rev20181203.shp LakeErie_Project_Extent_Final.shp LakeErie_Tileindex.shp
	RAWPOINTCLOUD	Calibrated Raw Point cloud strips (one folder per lift), each strip separated for channel 1 & 2 (zipped .las v1.4 format)	e.g. 0717098a/071709844.laz (for channel 1) e.g. 0717098a/071739844.laz (for channel 2)

Vertical Accuracy Assessment

Kinematic

Below is a summary of the statistics between the point cloud TIN from the ground class and the kinematic points surveyed on the road:

Number of points:	40108	
Average dz:	0.000	m
Minimum dz:	-0.160	m
Maximum dz:	0.170	m
Average magnitude:	0.023	m
Root mean square:	0.031	m
Std deviation:	0.031	m

Kinematic Vertical

Accuracy (95%): 0.061 m

For a complete listing of the kinematic points and their differences, please refer to the spreadsheet named "LakeErie_NVA_Kinematic_comparisons_Final.xlsx" provided with the deliverables.

This Kinematic vertical accuracy assessment is provided only as a reference. It is biased because during calibration, the point cloud was vertically shifted to these points. It should not be used as an independent check for accuracy assessments.

The independent assessment of vertical accuracy is made against the two "Non-Vegetated" points surveyed (Fast Static and RTK).

Fast Static

Below is a summary of the statistics between the point cloud TIN from the ground class and the fast static points surveyed on the road:

Number of points:	371	
Average dz:	0.010	m
Minimum dz:	-0.160	m
Maximum dz:	0.410	m
Average magnitude:	0.045	m
Root mean square:	0.062	m
Std deviation:	0.061	m

Fast Static Vertical

Accuracy (95%): 0.120 m

For a complete listing of the kinematic points and their differences, please refer to the spreadsheet named "LakaErie_NVA_FastStatic_comparisons_Final.xlsx" provided with the deliverables.

This Fast Static vertical accuracy assessment can be used as an independent check for the Non-Vegetated Accuracy (NVA).

RTK (NVA)

Below is a summary of the statistics between the point cloud TIN from the ground class and the RTK points surveyed on the road (NVA):

Number of points:	813	
Average dz:	0.005	m
Minimum dz:	-0.110	m
Maximum dz:	0.161	m
Average magnitude:	0.027	m
Root mean square:	0.035	m
Std deviation:	0.035	m

RTK Vertical

Accuracy (95%): 0.069 m

For a complete listing of the kinematic points and their differences, please refer to the spreadsheet named "LakeErie_NVA_RTK_comparisons_Final.xlsx" provided with the deliverables.

This RTK vertical accuracy assessment can be used as an independent check for the Non-Vegetated Accuracy (NVA).

As seen in the two NVA comparisons above, the Fast Static alone has an accuracy of 0.120 m and the RTK non-vegetated has an accuracy of 0.069 m. When all NVA points are combined, the RMS is 4.5 cm, translating to a vertical accuracy (95%) of 0.088 m. The accuracy for the project is therefore met since the required QL0 NVA vertical accuracy is 0.096 cm (95%).

Geodetic Points

As an extra check, the points from the geodetic network that were flush with ground level were also compared to the Lidar ground surface.

All Cannaet stations were removed as they are on building roofs. Station 843025 was also removed as it is a calibration concrete pillar. Station 71U117 was also removed as it is on a concrete culvert. Stations 71U080, 810111 and 84U149 were also removed as they are deep benchmarks typically two to three decimeters below ground level.

See Appendix C for the List of Vertical Differences for the Geodetic Points.

RTK (VVA)

The elevations of the points surveyed in various vegetated land cover types were compared to the Lidar ground surface. Since the elevation differences for this type of accuracy does not follow a normal distribution, the percentile method is used and not the 95% confidence level. For the 659 VVA points surveyed, sorting the absolute differences from the smallest to the largest gives the accuracy at the 95th percentile. For this sample, the 626th difference gives the accuracy at the 95th percentile.

For this project, the VVA accuracy is therefore 18.3 cm.

This is slightly above the required specifications of 14.7 cm (the QL0 VVA specification).

For a complete listing of the kinematic points and their differences, please refer to the spreadsheet named "LakeErie_VVA_RTK_comparisons_Final.xlsx" provided with the deliverables.

Conclusion

This is the final report covering the spring 2017, fall 2018 and spring 2018 portions of the Lake Erie Lidar project. Topics such as field operations, control, data processing and final accuracy results were explained. Such a large area required three seasons to acquire within the constraint of leaf off, snow off and adequate flight weather. It took longer than anticipated but the full project was eventually entirely acquired in the spring of 2018. Vertical accuracies of non-vegetated surfaces meet the QL0 requirement for this project.

Appendix A

Table of Lifts and Flight Parameters

FlightDate	JulianDay	Lift	Flt_Hours	System	AGL_m	Speed_kts	Pulse_kHz	ScanRate_Hz	FOV_deg	ProjectManager	Operator	Aircraft_Co	Aircraft	Deliv.
11/03/2017	070a	5417070a	3.6	Q1560 (54)	700	150	533	313	60	A. Fox	A. Fox	ARIES	C-FFRY	1
12/03/2017	071a	5417071a	5.6	Q1560 (54)	700	150	533	313	60	A. Fox	A. Fox	ARIES	C-FFRY	1
23/03/2017	082a	7917082a	6.6	ALS70 (79)	1000	140	500	53	40	T. Willms	T. Trithardt	ARIES	C-FFRY	1
29/03/2017	088a	7917088a	6.5	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	1
02/04/2017	092a	7917092a	7.3	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	1
02/04/2017	092b	7917092b	4.3	ALS70 (79)	1000	140	500	53	40	T. Willms	T. Trithardt	ARIES	C-FFRY	1
03/04/2017	093a	7917093a	1.9	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	1
07/04/2017	097a	0717097a	7.0	ALS70 (07)	1000	140	500	53	40	T. Willms	T. Trithardt	KALUS	C-GKSI	1
07/04/2017	097a	7917097a	5.5	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	1
08/04/2017	098a	0717098a	6.0	ALS70 (07)	1000	140	500	53	40	T. Willms	T. Trithardt	KALUS	C-GKSI	1
08/04/2017	098a	7917098a	6.1	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	1
09/04/2017	099a	7917099a	6.8	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
09/04/2017	099b	7917099b	4.6	ALS70 (79)	1000	140	500	53	40	T. Willms	T. Trithardt	ARIES	C-FFRY	2
10/04/2017	100a	7917100a	5.1	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
14/04/2017	104a	0717104a	7.3	ALS70 (07)	1000	140	500	53	40	T. Willms	T. Trithardt	KALUS	C-GKSI	1
14/04/2017	104a	7917104a	6.6	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
17/04/2017	107a	7917107a	2.6	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
18/04/2017	108a	7917108a	7.0	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
23/04/2017	113a	7917113a	5.9	ALS70 (79)	1000	140	500	53	40	T. Willms	R. Rutledge	ARIES	C-FFRY	2
23/04/2017	113b	7917113b	5.2	ALS70 (79)	1000	140	500	53	40	T. Willms	A. Blair	ARIES	C-FFRY	2
23/04/2017	113a	0717113a	5.8	ALS70 (07)	1000	140	500	53	40	T. Willms	A. Blair	KALUS	C-GKSI	2
23/04/2017	113b	0717113b	4.1	ALS70 (07)	1000	140	500	53	40	T. Willms	R. Rutledge	KALUS	C-GKSI	2
24/04/2017	114a	7917114a	6.6	ALS70 (79)	1000	140	500	53	40	T. Willms	A. Blair	ARIES	C-FFRY	2
29/04/2017	119a	0717119a	2.5	ALS70 (07)	1000	140	500	53	40	G. Bouma	A. Blair	KALUS	C-GKSI	2
07/05/2017	127a	0717127a	2.5	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	2
08/05/2017	128a	0717128a	6.6	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	2
09/05/2017	129a	0717129a	7.3	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	2
09/05/2017	129b	0717129b	3.3	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	2
10/05/2017	130a	0717130a	4.8	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	2
11/05/2017	131a	0717131a	6.8	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
12/05/2017	132a	0717132a	4.1	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
13/05/2017	133a	0717133a	3.5	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
15/05/2017	135a	0717135a	7.1	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
15/05/2017	135b	0717135b	3.9	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
16/05/2017	136a	0717136a	4.9	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
17/05/2017	137a	0717137a	7.0	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
18/05/2017	138a	0717138a	3.2	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
20/05/2017	140a	0717140a	4.1	ALS70 (07)	1000	140	500	53	40	G. Bouma	D. Tarr	KALUS	C-GKSI	3
20/10/2017	293a	0717293a	6.4	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	4
21/10/2017	294a	0717294a	6.5	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	4
22/10/2017	295a	0717295a	5.7	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	4
23/10/2017	296a	0717296a	4.8	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	4
27/10/2017	300b	9317300b	4.4	VQ1560i (93)	700	150	533	313	60	A. Fox	F. Salagubas	KALUS	C-GMEC	4
30/10/2017	303a	9317303a	3.9	VQ1560i (93)	700	150	533	313	60	A. Fox	F. Salagubas	KALUS	C-GMEC	4
07/11/2017	311a	9317311a	3.5	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	4
08/11/2017	312a	9317312a	6.7	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	4
08/11/2017	312a	0717312a	6.0	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	5
09/11/2017	313a	9317313a	3.9	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	4
12/11/2017	316a	0717316a	6.8	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	5
12/11/2017	316a	9317316a	6.1	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	4
15/11/2017	319a	9317319a	5.2	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	4
15/11/2017	319a	0717319a	3.5	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Blair	KALUS	C-GKSI	5
21/11/2017	325a	0717325a	7.3	ALS70 (07)	1000	140	500	53	40	A. Fox	G. Westergard	KALUS	C-GKSI	5
21/11/2017	325a	9317325a	6.4	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	5
24/11/2017	328a	9317328a	6.4	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	5
27/11/2017	331a	9317331a	2.8	VQ1560i (93)	700	150	533	313	60	A. Fox	T. Trithardt	KALUS	C-GMEC	5
28/11/2017	332a	0717332a	7.0	ALS70 (07)	1000	140	500	53	40	A. Fox	G. Westergard	KALUS	C-GKSI	5
02/12/2017	336a	0717336a	5.1	ALS70 (07)	1000	140	500	53	40	A. Fox	G. Westergard	KALUS	C-GKSI	5
04/12/2017	338a	0717338a	3.7	ALS70 (07)	1000	140	500	53	40	A. Fox	G. Westergard	KALUS	C-GKSI	5
06/12/2017	340a	0717340a	5.1	ALS70 (07)	1000	140	500	53	40	A. Fox	G. Westergard	KALUS	C-GKSI	6
06/12/2017	340a	9317340a	6.0	VQ1560i (93)	700	150	533	313	60	A. Fox	J. Anderson	KALUS	C-GMEC	5
20/03/2018	079a	0718079a	2.4	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Fox	KALUS	C-GKSI	6
20/03/2018	080a	0718080a	4.2	ALS70 (07)	1000	140	500	53	40	A. Fox	A. Fox	KALUS	C-GKSI	6
25/03/2018	084a	0718084a	6.5	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
26/03/2018	085a	0718085a	7.0	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
27/03/2018	086a	0718086a	6.4	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
31/03/2018	090a	0718090a	7.0	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
02/04/2018	092a	0718092a	6.7	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
03/04/2018	093a	0718093a	4.5	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
09/04/2018	099a	0718099a	4.3	ALS70 (07)	1000	140	500	53	40	A. Fox	T. Trithardt	KALUS	C-GKSI	6
29/04/2018	119a	3818119a	6.5	VQ1560i (38)	700	150	533	313	60	A. Fox	D. Tarr	KALUS	C-GKSI	6
01/05/2018	121a	0718121a	4.9	ALS70 (07)	1000	140	500	53	40	A. Fox	C. Johnson	KALUS	C-GKSI	6
02/05/2018	122a	0718122a	7.0	ALS70 (07)	1000	140	500	53	40	A. Fox	C. Johnson	KALUS	C-GKSI	6
08/05/2018	128a	0718128a	5.8	ALS70 (07)	1000	140	500	53	40	A. Fox	C. Johnson	KALUS	C-GKSI	6

Appendix B

Daily Lidar Field Acquisition Report

Daily Lidar Field Acquisition Report

Project: 1638_OMAFRA_LakeErie

Date	Aircraft One	C-FFRY	Riegl (54) & Leica (79)	Aircraft Two	C-GKSI	Leica (07)	Description
	Acquisition?	Mission 1	Mission 2	Acquisition?	Mission 1	Mission 2	
March 6, 2017	No			No			
March 7, 2017	No			No			
March 8, 2017	No			No			Aircraft C-FFRY Mobilization to Ontario
March 9, 2017	No			No			Aircraft C-FFRY arrives in Chatham, ON (System 54)
March 10, 2017	No			No			Bad weather / project set up with airport staff
March 11, 2017	Yes	5417070a		No			One mission flown
March 12, 2017	Yes	5417071a		No			One mission flown
March 13, 2017	No			No			Bad weather
March 14, 2017	No			No			Bad weather - monitoring snow accumulation
March 15, 2017	No			No			Snow conditions
March 16, 2017	No			No			Snow conditions
March 17, 2017	No			No			Snow conditions
March 18, 2017	No			No			Snow conditions
March 19, 2017	No			No			FFRY to MTL for sensor exchange & Snow Conditions
March 20, 2017	No			No			Sensor exchange MTL & Snow Conditions
March 21, 2017	No			No			FFRY back to Chatham & Snow Conditions
March 22, 2017	No			No			Mission attempted but low clouds prevented acquisition
March 23, 2017	Yes	7917082a		No			One mission flown
March 24, 2017	No			No			Poor weather, complete aircraft maintenance
March 25, 2017	No			No			Poor weather
March 26, 2017	No			No			Poor weather
March 27, 2017	No			No			Poor weather
March 28, 2017	No			No			Poor weather

Date	Aircraft One	C-FFRY	Riegl (54) & Leica (79)	Aircraft Two	C-GKSI	Leica (07)	Description
	Acquisition?	Mission 1	Mission 2	Acquisition?	Mission 1	Mission 2	
March 29, 2017	Yes	7917088a		No			One mission flown
March 30, 2017	No			No			Poor weather
March 31, 2017	No			No			Poor weather
April 1, 2017	No			No			System 7207 arrives, Poor weather
April 2, 2017	Yes	7917092a	7917092b	No			System 7207 down, awaiting pilot display replacement
April 3, 2017	Yes	7917093a		No			Mission aborted after 4 lines due to weather
April 4, 2017	No			No			Poor weather, pilot display replaced on system 7207
April 5, 2017	No			No			Poor weather
April 6, 2017	No			No			Poor weather
April 7, 2017	Yes	7917097a		Yes	0717097a		2 missions flown
April 8, 2017	Yes	7917098a		Yes	0717098a		1 mission flown with 7179 & Laser failure mid-flight with 7207
April 9, 2017	Yes	7917099a	7917099b	No			2 missions flown with 7179, 7207 being repaired
April 10, 2017	Yes	7917100a		No			1 mission flown with 7179, 7207 being repaired
April 11, 2017	No			No			Poor weather but test flight 7207. Problem is now fixed
April 12, 2017	No			No			Poor weather
April 13, 2017	Yes	7917103a		No			Abort for weather, xtie Area 4
April 14, 2017	Yes	7917104a		Yes	0717104a		2 missions flown
April 15, 2017	No			No			Poor weather
April 16, 2017	No			No			Poor weather
April 17, 2017	Yes	7917107a		No			One short mission due to clouds
April 18, 2017	Yes	7917108a		No			One mission flown
April 19, 2017	No			No			Poor weather
April 20, 2017	No			No			Poor weather
April 21, 2017	No			No			Poor weather, move base of operations from Chatham to St Thomas
April 22, 2017	No	7917112a		No			One mission attempted but aborted due to poor weather
April 23, 2017	Yes	7917113a	7917113b	Yes	0717113a	0717113b	4 missions flown
April 24, 2017	Yes	7917114a		No			1 mission flown with 7179, intermittent system problems with system 7207
April 25, 2017	No			No			Poor weather, 7179 relocate to Peterborough, 7207 depart for repair

	Aircraft One	C-FFRY	Leica (79)	Aircraft Two	C-GKSI	Leica (07)	
Date	Acquisition?	Mission 1	Mission 2	Acquisition?	Mission 1	Mission 2	Description
April 26, 2017	No	System in Peterborough		No			Aircraft C-GKSI with 7207 in the US for repair
April 27, 2017	No	System in Peterborough		No			Aircraft C-GKSI with 7207 in the US for repair
April 28, 2017	No	System in Peterborough		No			C-GKSI returned to St. Thomas late afternoon.
April 29, 2017	No	System in Peterborough		Yes	0717119a		7207 partial mission – 5.5 lines, system failed
April 30, 2017	No	System in Peterborough		No			Waiting for parts from Leica, rain/low cloud
May 1, 2017	No	System in Peterborough		No			Waiting for parts from Leica, rain/low cloud
May 2, 2017	No	System in Peterborough		No			Waiting for parts from Leica, rain/low cloud
May 3, 2017	No	System in Peterborough		No			Waiting for parts from Leica, rain/low cloud
May 4, 2017	No	System in Peterborough		No			Leica technician replaced TDC board & housing
May 5, 2017	No	System in Peterborough		No			Rain
May 6, 2017	No	System in Peterborough		No			Rain
May 7, 2017	No	System in Peterborough		Yes	0717127a		7207 Partial mission (low cloud), system appears stable
May 8, 2017	No	System in Peterborough		Yes	0717128a		Full mission – second mission not possible due to wind
May 9, 2017	No	System in Peterborough		Yes	0717129a		Full mission
May 10, 2017	No	System in Peterborough		Yes	0717130a		
May 11, 2017	No	System in Peterborough		Yes	0717131a		
May 12, 2017	No	System in Peterborough		Yes	0717132a		Mission cut short due to low cloud
May 13, 2017	No	System in Peterborough		Yes	0717133a		
May 14, 2017	No	System in Peterborough		No			Mission attempted but aborted due to low cloud
May 15, 2017	No	System in Peterborough		Yes	0717135a	0717135b	
May 16, 2017	No	System in Peterborough		Yes	0717136a		
May 17, 2017	No	System in Peterborough		Yes	0717137a		
May 18, 2017	No	System in Peterborough		Yes	0717138a		
May 19, 2017	No	System in Peterborough		No			Low cloud/rain
May 20, 2017	No	System in Peterborough		Yes	0717140a		Partial mission.
May 21, 2017	No						Aircraft demobilize from project area because of leaf-on conditions.
May 22, 2017	No						
May 23, 2017	No						

Break in Project until Fall 2017

	Aircraft One	C-FFRY	Riegl (54)	Aircraft Two	C-GKSI	7207	Aircraft Three	C-GMEC	Riegl (93)	
Date	Acquisition?	Mission 1	Mission 2	Acquisition?	Mission 1	Mission 2	Acquisition?	Mission 1	Mission 2	Description
October 18, 2017										
October 19, 2017										C-GKSI mobilized to YKF to begin work
October 20, 2017				Yes	0717293a					
October 21, 2017				Yes	0717294a					
October 22, 2017				Yes	0717295a					
October 23, 2017				Yes	0717296a					C-GMEC mobilized to YKF to join project
October 24, 2017				No			No			Rain and low cloud
October 25, 2017				No			No			Rain and low cloud
October 26, 2017				No			No			Low cloud all day
October 27, 2017				No			Yes	9317300b		GKSI attempted flight - aborted due to cloud
October 28, 2017				No			No			Low cloud and rain
October 29, 2017				No			No			Low cloud and rain
October 30, 2017				No			Yes	9317303a		Low cloud to the north
October 31, 2017				No			No			Low cloud and rain all day
November 1, 2017				No			No			Low cloud and rain
November 2, 2017				No			No			Heavy rain all day
November 3, 2017				No			No			Low cloud and rain
November 4, 2017				No			No			Low cloud and rain
November 5, 2017				No			No			Low cloud and rain
November 6, 2017				No			No			Low cloud and rain
November 7, 2017				No			Yes	9317311a		C-GKSI attempted and aborted due to cloud
November 8, 2017				Yes	0717312a		Yes	9317312a		
November 9, 2017				Yes	0717313a		Yes	9317313a		
November 10, 2017				No			No			Snowfall overnight - accumulations too high
November 11, 2017				No			No			Low cloud
November 12, 2017				Yes	0717316a		Yes	9317316a		
November 13, 2017				No			No			Low cloud and precipitation
November 14, 2017				No			No			Low cloud and precipitation

Date	Aircraft One Acquisition?	C-FFRY Mission 1	Riegl (54) Mission 2	Aircraft Two Acquisition?	C-GKSI Mission 1	7207 Mission 2	Aircraft Three Acquisition?	C-GMEC Mission 1	Riegl (93) Mission 2	Description
November 15, 2017				Yes	0717319a		Yes	9317319a		
November 16, 2017				No			No			Raining
November 17, 2017				No			No			Low cloud and rain
November 18, 2017				No			No			Raining
November 19, 2017				No			No			Snowing and raining most of day
November 20, 2017				No			No			Low cloud and scattered snow in project area
November 21, 2017				Yes	0717325a		Yes	9317325a		
November 22, 2017				No			No			Rain and snow throughout the day
November 23, 2017				No			No			Low overcast
November 24, 2017				No			Yes	9317328a		
November 25, 2017				No			No			Rain and snow - no accumulation
November 26, 2017				No			No			Low cloud and overcast
November 27, 2017				No			Yes	9317331a		Low cloud in block most of the day
November 28, 2017				Yes	0717332a		No			
November 29, 2017				No			No			Low cloud
November 30, 2017				No			No			Low cloud
December 1, 2017				No			No			Low cloud
December 2, 2017				Yes	0717336a		No			
December 3, 2017				No			No			Heavy fog am, cloud all day
December 4, 2017				Yes	0717338a		No			Low cloud
December 5, 2017				No			No			Low cloud and rain
December 6, 2017				Yes	0717340a		Yes	9317340a		
December 7, 2017				No			No			Low cloud and flurries
December 8, 2017				No			No			Low cloud and flurries
December 9, 2017				No			No			Low cloud and snow
December 10, 2017				No			No			Snow in project area
December 11, 2017				No			No			Both systems transit to Montreal, shut down for season
December 12, 2017										

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Date	Aircraft One Acquisition?	C-GKSI Mission 1	7207 Mission 2	Description
March 20, 2018	Yes	0718079a		Transit to YKF from Montreal, Mission attempt - ATC issues Pearson
March 21, 2018	Yes	0718080a		Night mission on East block
March 22, 2018				Poor weather
March 23, 2018				Poor weather
March 24, 2018				Poor weather
March 25, 2018	Yes	0718084a		Night mission
March 26, 2018	Yes	0718085a		Night mission
March 27, 2018	Yes	0718086a		Night mission - rain moved in during daytime
March 28, 2018				Rain
March 29, 2018				Rain and low cloud
March 30, 2018				Low cloud conditions
March 31, 2018	Yes	0718090a		Night mission
April 1, 2018				Low cloud and rain
April 2, 2018	Yes	0718092a		Night mission
April 3, 2018	Yes	0718093a		Evening mission - aborted due to snow
April 4, 2018				Rain and high winds
April 5, 2018				Poor weather
April 6, 2018				Poor weather
April 7, 2018				Poor weather
April 8, 2018				Poor weather
April 9, 2018	Yes	0718099a		Data acquisition complete.
April 10, 2018				
April 11, 2018				

April 12, 2018				
April 13, 2018				
April 14, 2018				
April 15, 2018				
April 16, 2018				
April 17, 2018				
April 18, 2018				
April 19, 2018				
April 20, 2018				
April 21, 2018				
April 22, 2018				
April 23, 2018				
April 24, 2018				Low density concerns.
April 25, 2018				
April 26, 2018				
April 27, 2018				Organize sensor re-mobilization for reflights over low density areas.
April 28, 2018				
April 29, 2018	Yes	3818119a		1 flight with Riegl 1560i
April 30, 2018				Poor weather
May 1, 2018	Yes	0718121a		1 flight with Leica ALS70
May 2, 2018	Yes	0718122a		1 flight with Leica ALS70
May 3, 2018				Poor weather
May 4, 2018				Poor weather
May 5, 2018				Poor weather
May 6, 2018				Poor weather
May 7, 2018				Poor weather
May 8, 2018	Yes	0718128a		1 flight with Leica ALS70. Data acquisition complete.

Appendix C

List of Vertical Differences for the Geodetic Points

Number	Easting	Northing	Known Z	Laser Z	Dz
883066	531789.76	4737003.67	230.68	230.76	0.08
A535	549458.42	4811548.08	311.10	311.11	0.02
A792	411247.17	4685088.82	195.45	195.49	0.04
A793	491403.70	4735972.60	234.34	234.39	0.05
A822	536993.76	4854941.42	460.66	460.77	0.12
A824	584220.32	4760528.29	204.34	204.33	-0.01
M053006	356422.05	4654270.47	174.76	174.70	-0.06
TEMP18	525870.20	4758077.80	274.33	274.28	-0.05

Average dz	0.023 m
Average magnitude	0.051 m
Maximum dz	0.115 m
Minimum dz	-0.062 m
Root mean square	0.061 m
Std deviation	0.060 m

Appendix D
Full Control Report

1638 OMAFRA Lake Erie Survey Control Report

- a.) Final Adjusted Coordinates
- b.) Traverse Overview
- c.) Traverse Report
- d.) Minimally Constrained Network Adjustment
- e.) Fully Constrained Network Adjustment
- f.) NRCan Can-Net Control Station Reports
- g.) NRCan Passive Control Station Reports

a.) Final Adjusted Coordinates

Project: 1638_OMAFRA_LakeErie_Merged_Constrained
 Program: GrafNet Version 8.50.4320
 Profile: All Network Summary
 Source: Network

Datum: NAD83(CSRS), (processing datum)
 Control IDs: LNDN, SARN, GBND, SPAR, WALL, CHA2, WLOR, ALV2, STHR, STFD, LSW2, GLP2, FLSH, ORVL, BURL, DNV2, SMCO, BTFD
 Geoid: CGG2013n83.wpg (Absolute correction)

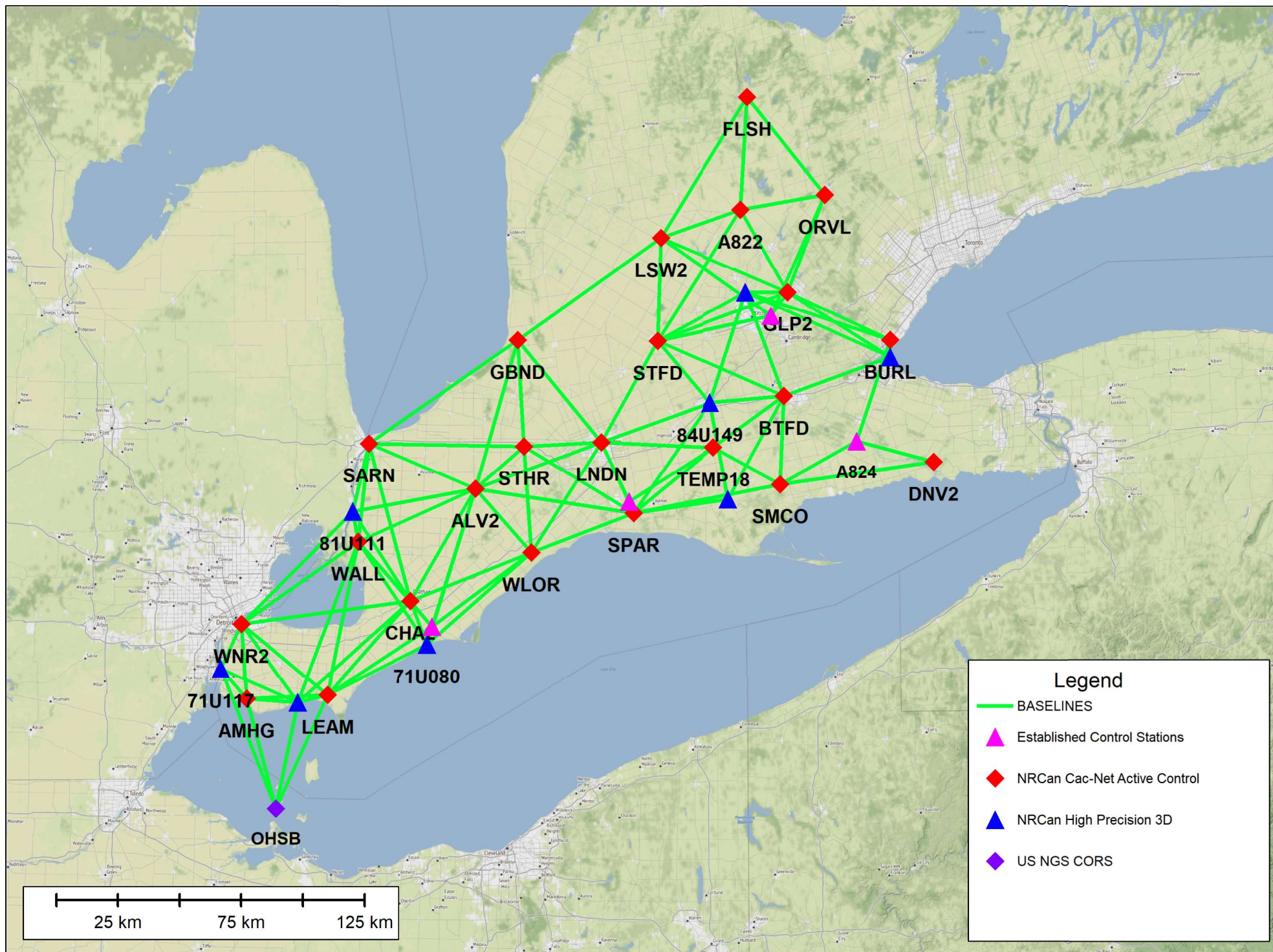
Map projection Info:
 Defined grid: UTM, Zone 17

Station	Latitude (+/-D M S)	Longitude (+/-D M S)	H-Ell (m)	Undulation (m)	H-MSL (m)	Northing (m)	Easting (m)
71U080	42 14 49.59927	-82 05 58.54490	162.815	-34.452	197.267	4677798.536	409286.726
71U117	42 08 39.34129	-83 06 50.10586	140.957	-34.290	175.247	4667956.329	325322.279
81U111	42 43 46.11194	-82 28 37.51059	142.011	-34.447	176.457	4731831.984	379077.215
843025	43 32 32.82456	-80 31 05.45578	301.975	-35.196	337.171	4821168.703	538924.962
84U149	43 08 19.64867	-80 42 00.02628	263.543	-35.166	298.710	4776271.193	524396.810
883066	42 47 05.69418	-80 36 40.80498	195.411	-35.273	230.683	4737003.668	531789.760
A535	43 27 18.73960	-80 23 19.24400	275.727	-35.369	311.095	4811548.082	549458.419
A792	42 18 46.73734	-82 04 37.03279	160.987	-34.459	195.446	4685088.820	411247.165
A793	42 46 34.46818	-81 06 18.30494	199.213	-35.131	234.344	4735972.599	491403.704
A822	43 50 47.86462	-80 32 23.15891	425.686	-34.969	460.655	4854941.424	536993.757
A824	42 59 33.92521	-79 58 00.67119	168.898	-35.437	204.335	4760528.290	584220.319
ALV2	42 49 09.89973	-81 52 09.15298	194.873	-34.607	229.481	4741127.983	428944.857
AMHG	42 02 12.05169	-82 59 05.23667	159.762	-34.587	194.349	4655754.655	335715.563
BTFD	43 09 37.42146	-80 19 45.02436	215.712	-35.455	251.167	4778845.011	554535.610
BURL	43 21 40.23637	-79 47 28.50816	87.893	-35.856	123.749	4801633.542	597944.429
CHA2	42 24 21.82073	-82 11 08.73419	158.655	-34.477	193.132	4695543.311	402424.377
DNV2	42 54 46.35547	-79 35 03.43328	152.033	-35.281	187.313	4752112.112	615556.210
FLSH	44 15 31.37887	-80 30 17.01015	452.800	-35.033	487.834	4900727.805	539535.289
GBND	43 22 00.57951	-81 39 56.66293	187.002	-34.785	221.787	4801766.879	446060.504
GLP2	43 32 28.50946	-80 18 21.64607	315.124	-35.410	350.534	4821156.748	556066.788
LEAM	42 03 21.79101	-82 35 18.98585	160.062	-34.630	194.692	4657220.630	368549.097
LNDN	42 59 39.08802	-81 14 38.90110	218.567	-34.940	253.507	4760198.644	480098.738
LSW2	43 44 32.73890	-80 56 46.44816	359.642	-34.838	394.480	4843266.880	504329.117
M053004	43 17 58.42096	-79 47 36.67798	40.094	-35.825	75.919	4794788.108	597859.428
M053006	42 01 38.54132	-82 44 03.76751	140.101	-34.661	174.762	4654270.473	356422.046
OHSB	41 38 11.21610	-82 49 47.18034	148.329	-35.062	183.391	4611029.954	347600.041
ORVL	43 53 52.49044	-80 06 44.11670	428.199	-35.346	463.545	4860917.468	571296.233
SARN	42 58 53.51909	-82 24 10.41417	159.112	-34.362	193.474	4759718.874	385617.454
SMCO	42 50 17.50056	-80 21 02.37812	203.593	-35.331	238.924	4743051.295	553065.339
SPAR	42 44 01.37594	-81 04 51.83255	206.640	-35.154	241.795	4731248.236	493364.097
STFD	43 21 56.41430	-80 57 46.36284	332.910	-34.875	367.786	4801423.870	503007.702
STHR	42 58 41.32035	-81 37 45.57310	209.453	-34.751	244.203	4758579.908	448686.435
TEMP18	42 58 29.68817	-80 40 57.84914	239.114	-35.212	274.326	4758077.802	525870.203

WALL	42	37	08.25849	-82	26	49.33850	147.762	-34.411	182.172	4719517.272	381327.013
WLOR	42	35	17.34193	-81	35	16.94003	185.655	-34.831	220.486	4715248.822	451750.971
WNR2	42	18	30.71918	-83	01	00.48586	158.714	-34.054	192.768	4686002.856	333779.277

b.) Traverse Overview

1638 OMAFRA Lake Erie Survey Control Network



c.) Traverse Report

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*****
* GrafNet - GRAPHIC GPS NETWORK PROCESSING *
*          SOFTWARE PACKAGE                *
*                                          *
* TRAVERSE SOLUTION:                     *
*                                          *
* Copyright NovAtel Inc. (2014)          *
*                                          *
* Version: 8.50.4320                     *
*                                          *
* PROJECT: 1638_OMAFRA_LakeErie_Merged  *
*****

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DATE: 1/08/2019 (m/d/y)
TIME: 8:05:53

DATUM: NAD83 (CSRS)
GRID: UTM, Zone 17
UNITS: metres (see Preferences to change)
GEOID: C:\Geoids\Canada\CGG2013n83.wpg

```

*****
STATIONS (STATUS):
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Station	Type	HgtStatus	Result	Coordinates derived from...			
71U080	Check-3D	OK	Good	ALV2	LNDN		
71U117	Check-3D	OK	Good	M053006	CHA2	ALV2	LNDN
81U111	Check-3D	OK	Good	ALV2	LNDN		
843025	Check-3D	OK	Good	STFD	LNDN		
84U149	Check-3D	OK	Good	LNDN			
883066	Check-3D	OK	Good	84U149	LNDN		
A535	Loop Tie	OK	Good	STFD	LNDN		
A792	Loop Tie	OK	Good	ALV2	LNDN		
A793	Check-3D	OK	Good	LNDN			
A822	Loop Tie	OK	Good	STFD	LNDN		
A824	Loop Tie	OK	Good	SMCO	SPAR	LNDN	
ALV2	Check-3D	OK	Good	LNDN			
AMHG	Check-3D	OK	Good	LEAM	71U080	ALV2	LNDN
BTFD	Check-3D	OK	Good	84U149	LNDN		
BURL	Check-3D	OK	Good	843025	STFD	LNDN	
CHA2	Check-3D	OK	Good	ALV2	LNDN		
DNV2	Check-3D	OK	Good	SMCO	SPAR	LNDN	
FLSH	Check-3D	OK	Good	A822	STFD	LNDN	
GBND	Check-3D	OK	Good	LNDN			
GLP2	Check-3D	OK	Good	STFD	LNDN		
LEAM	Check-3D	OK	Good	71U080	ALV2	LNDN	
LNDN	Control-3D	OK	Pub (3D)	(-)			
LSW2	Check-3D	OK	Good	GBND	LNDN		
M053004	Check-3D	OK	Good	843025	STFD	LNDN	
M053006	Check-3D	OK	Good	CHA2	ALV2	LNDN	
OHSB	Check-3D	OK	Good	LEAM	71U080	ALV2	LNDN
ORVL	Check-3D	OK	Good	A535	STFD	LNDN	
SARN	Check-3D	OK	Good	ALV2	LNDN		
SMCO	Check-3D	OK	Good	SPAR	LNDN		
SPAR	Check-3D	OK	Good	LNDN			
STFD	Check-3D	OK	Good	LNDN			
STHR	Check-3D	OK	Good	LNDN			
TEMP18	Loop Tie	OK	Good	LNDN			
WALL	Check-3D	OK	Good	ALV2	LNDN		
WLOR	Check-3D	OK	Good	LNDN			
WNR2	Check-3D	OK	Good	81U111	ALV2	LNDN	

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STATIONS (COORDINATES):

Station	Latitude (D M S)	Longitude (D M S)	Grid-E (m)	Grid-N (m)	EllHgt (m)	OrthoHgt (m)
71U080	42 14 49.59936	-82 05 58.54425	409286.741	4677798.539	162.805	197.257
71U117	42 08 39.34088	-83 06 50.10549	325322.288	4667956.316	140.940	175.230
81U111	42 43 46.11186	-82 28 37.51057	379077.216	4731831.981	142.010	176.457
843025	43 32 32.82493	-80 31 05.45575	538924.963	4821168.714	301.971	337.167
84U149	43 08 19.64864	-80 42 00.02600	524396.816	4776271.193	263.517	298.683
883066	42 47 05.69389	-80 36 40.80484	531789.763	4737003.659	195.389	230.661
A535	43 27 18.73962	-80 23 19.24404	549458.417	4811548.082	275.731	311.099
A792	42 18 46.73724	-82 04 37.03282	411247.164	4685088.817	160.991	195.450
A793	42 46 34.46828	-81 06 18.30483	491403.706	4735972.602	199.219	234.350
A822	43 50 47.86471	-80 32 23.15901	536993.755	4854941.426	425.695	460.663
A824	42 59 33.92564	-79 58 00.67080	584220.327	4760528.304	168.910	204.347
ALV2	42 49 09.89974	-81 52 09.15284	428944.860	4741127.983	194.870	229.478
AMHG	42 02 12.05191	-82 59 05.23582	335715.583	4655754.662	159.755	194.342
BTFD	43 09 37.42168	-80 19 45.02409	554535.616	4778845.018	215.659	251.114
BURL	43 21 40.23673	-79 47 28.50836	597944.424	4801633.553	87.894	123.750
CHA2	42 24 21.82036	-82 11 08.73403	402424.381	4695543.299	158.641	193.118
DNV2	42 54 46.35597	-79 35 03.43376	615556.199	4752112.127	152.072	187.353
FLSH	44 15 31.37900	-80 30 17.01033	539535.285	4900727.809	452.820	487.854
GBND	43 22 00.57957	-81 39 56.66284	446060.506	4801766.881	186.991	221.777
GLP2	43 32 28.50950	-80 18 21.64605	556066.789	4821156.750	315.127	350.537
LEAM	42 03 21.79102	-82 35 18.98516	368549.113	4657220.630	160.047	194.677
LNDN	42 59 39.08805	-81 14 38.90100	480098.740	4760198.645	218.558	253.498
LSW2	43 44 32.73881	-80 56 46.44819	504329.116	4843266.877	359.634	394.473
M053004	43 17 58.42137	-79 47 36.67780	597859.432	4794788.121	40.089	75.914
M053006	42 01 38.54096	-82 44 03.76728	356422.051	4654270.462	140.088	174.749
OHSB	41 38 11.21620	-82 49 47.17948	347600.062	4611029.957	148.306	183.368
ORVL	43 53 52.49055	-80 06 44.11670	571296.233	4860917.471	428.223	463.569
SARN	42 58 53.51906	-82 24 10.41417	385617.454	4759718.874	159.108	193.469
SMCO	42 50 17.50084	-80 21 02.37789	553065.345	4743051.304	203.592	238.923
SPAR	42 44 01.37626	-81 04 51.83224	493364.104	4731248.245	206.642	241.796
STFD	43 21 56.41437	-80 57 46.36277	503007.704	4801423.872	332.918	367.794
STHR	42 58 41.32038	-81 37 45.57304	448686.436	4758579.909	209.438	244.189
TEMP18	42 58 29.68813	-80 40 57.84931	525870.200	4758077.801	239.093	274.305
WALL	42 37 08.25847	-82 26 49.33847	381327.014	4719517.272	147.760	182.171
WLOR	42 35 17.34194	-81 35 16.93997	451750.972	4715248.822	185.650	220.481
WNR2	42 18 30.71898	-83 01 00.48578	333779.279	4686002.849	158.719	192.774

LOOP, CHECK & DUPLICATE TIES:

Name/Session	Type	Result	DEast (m)	DNorth (m)	DHeight (m)
POINT 71U080	CheckPnt	Good	0.0177	0.0100	-0.0540
ALV2 to 71U080 (1)	Duplicate	Good	0.0190	0.0020	-0.0052
POINT 71U117	CheckPnt	Good	0.0188	-0.0110	-0.0311
POINT 81U111	CheckPnt	Good	-0.0030	-0.0115	0.0046
POINT 843025	CheckPnt	Good	0.0059	0.0061	0.0201
84U149 to 843025	LoopTie	Good	0.0047	0.0125	0.0201
BTFD to 843025	LoopTie	Good	-0.0063	0.0042	0.0478
POINT 84U149	CheckPnt	Good	0.0268	0.0072	-0.0121
POINT 883066	CheckPnt	Good	0.0184	0.0024	-0.0315
ALV2 to A792 (2)	Duplicate	Good	-0.0042	-0.0064	0.0040
71U080 to A792	LoopTie	Good	-0.0176	-0.0070	0.0179
71U080 to A792 (3)	Duplicate	Good	-0.0140	-0.0060	0.0112
POINT A793	CheckPnt	Good	-0.0012	0.0103	-0.0132
POINT ALV2	CheckPnt	Good	0.0082	0.0002	-0.0057
POINT AMHG	CheckPnt	Good	0.0210	0.0126	-0.0561
LEAM to AMHG (2)	Duplicate	Good	0.0052	0.0079	0.0020
71U117 to AMHG	LoopTie	Good	0.0091	0.0215	0.0132
POINT BTFD	CheckPnt	Good	0.0059	0.0097	-0.0551

STFD to BTFD	LoopTie	Good	0.0116	0.0101	-0.0506
883066 to BTFD (1)	Duplicate	Good	0.0113	0.0141	-0.0306
883066 to BTFD	LoopTie	Good	0.0141	0.0178	-0.0318
POINT BURL	CheckPnt	Good	-0.0198	0.0241	0.0082
A824 to BURL	LoopTie	Good	-0.0171	-0.0068	-0.0142
POINT CHA2	CheckPnt	Good	0.0064	-0.0134	-0.0190
ALV2 to CHA2 (2)	Duplicate	Good	0.0018	-0.0123	-0.0127
71U080 to CHA2	LoopTie	Good	-0.0109	-0.0137	-0.0069
81U111 to CHA2	LoopTie	Good	0.0009	-0.0026	-0.0052
A792 to CHA2	LoopTie	Good	0.0072	-0.0121	-0.0163
A792 to CHA2 (2)	Duplicate	Good	0.0022	-0.0074	-0.0206
POINT DNV2	CheckPnt	Good	-0.0087	0.0053	0.0220
A824 to DNV2	LoopTie	Good	-0.0196	-0.0063	0.0367
POINT FLSH	CheckPnt	Good	-0.0021	-0.0028	0.0164
POINT GBND	CheckPnt	Good	0.0014	0.0019	-0.0017
ALV2 to GBND (1)	Duplicate	Good	0.0031	0.0019	-0.0189
ALV2 to GBND	LoopTie	Good	-0.0014	0.0020	-0.0066
POINT GLP2	CheckPnt	Good	0.0009	0.0015	0.0094
843025 to GLP2	LoopTie	Good	0.0002	-0.0082	0.0039
A535 to GLP2	LoopTie	Good	-0.0015	0.0003	-0.0049
A535 to GLP2 (2)	Duplicate	Good	0.0058	0.0022	-0.0047
A822 to GLP2	LoopTie	Good	0.0023	0.0017	-0.0194
BURL to GLP2	LoopTie	Good	0.0044	-0.0081	0.0074
POINT LEAM	CheckPnt	Good	0.0192	0.0025	-0.0351
A792 to LEAM	LoopTie	Good	0.0190	0.0028	-0.0143
A792 to LEAM (2)	Duplicate	Good	0.0155	0.0025	-0.0214
CHA2 to LEAM	LoopTie	Good	0.0120	0.0121	-0.0038
CHA2 to LEAM (2)	Duplicate	Good	0.0136	0.0169	0.0047
POINT LSW2	CheckPnt	Good	0.0084	-0.0068	-0.0128
STFD to LSW2	LoopTie	Good	-0.0029	-0.0025	-0.0125
A535 to LSW2	LoopTie	Good	-0.0036	0.0009	-0.0176
A822 to LSW2	LoopTie	Good	0.0036	-0.0102	-0.0025
FLSH to LSW2	LoopTie	Good	0.0049	-0.0063	-0.0302
GLP2 to LSW2	LoopTie	Good	0.0011	-0.0031	-0.0087
POINT M053004	CheckPnt	Good	0.0062	0.0132	0.0159
BTFD to M053004	LoopTie	Good	0.0059	0.0084	0.0392
GLP2 to M053004	LoopTie	Good	0.0040	0.0127	-0.0095
BURL to M053004	LoopTie	Good	0.0063	0.0042	-0.0025
BURL to M053004 (2)	Duplicate	Good	0.0095	-0.0013	-0.0081
POINT M053006	CheckPnt	Good	0.0006	-0.0129	-0.0198
AMHG to M053006	LoopTie	Good	-0.0140	-0.0187	-0.0050
LEAM to M053006	LoopTie	Good	-0.0109	-0.0092	0.0027
POINT OHSB	CheckPnt	Good	0.0188	0.0053	-0.0462
M053006 to OHSB	LoopTie	Good	0.0091	0.0151	0.0106
71U117 to OHSB	LoopTie	Good	0.0091	0.0137	-0.0134
AMHG to OHSB	LoopTie	Good	0.0044	-0.0011	-0.0069
AMHG to OHSB (2)	Duplicate	Good	0.0019	-0.0004	-0.0212
POINT ORVL	CheckPnt	Good	-0.0054	0.0006	0.0186
A822 to ORVL	LoopTie	Good	-0.0015	0.0038	0.0049
GLP2 to ORVL	LoopTie	Good	-0.0028	0.0001	0.0354
FLSH to ORVL	LoopTie	Good	0.0039	0.0003	0.0052
POINT SARN	CheckPnt	Good	-0.0014	-0.0012	-0.0135
ALV2 to SARN (2)	Duplicate	Good	-0.0013	0.0001	0.0022
GBND to SARN	LoopTie	Good	-0.0061	-0.0032	0.0172
81U111 to SARN	LoopTie	Good	0.0007	0.0006	0.0018
CHA2 to SARN (1)	Duplicate	Good	0.0037	0.0123	0.0080
CHA2 to SARN	LoopTie	Good	-0.0063	0.0107	0.0089
POINT SMCO	CheckPnt	Good	0.0021	0.0087	0.0138
SPAR to SMCO (3)	Duplicate	Good	-0.0051	-0.0014	-0.0049
BTFD to SMCO	LoopTie	Good	0.0010	0.0024	0.0537
POINT SPAR	CheckPnt	Good	0.0049	0.0125	0.0036
LNDN to SPAR (2)	Duplicate	Good	-0.0000	-0.0000	0.0000
84U149 to SPAR	LoopTie	Good	0.0067	0.0038	0.0394
883066 to SPAR	LoopTie	Good	0.0007	0.0246	0.0254
A793 to SPAR	LoopTie	Good	0.0046	0.0073	-0.0072
ALV2 to SPAR (1)	Duplicate	Good	0.0058	0.0098	-0.0058
ALV2 to SPAR	LoopTie	Good	-0.0006	0.0101	-0.0029

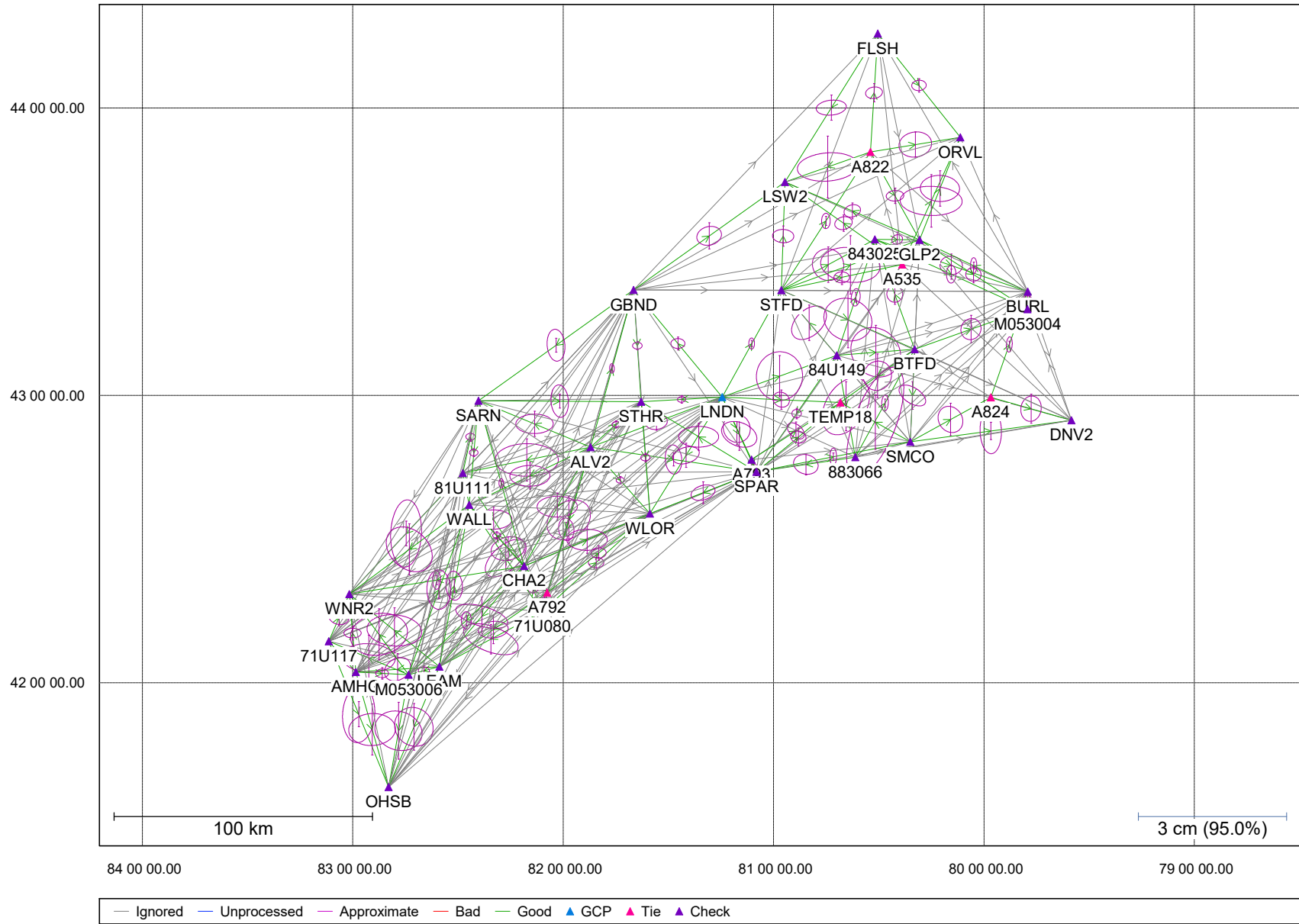
POINT STFD	CheckPnt	Good	0.0019	0.0023	0.0185
84U149 to STFD	LoopTie	Good	-0.0064	0.0023	0.0102
POINT STHR	CheckPnt	Good	-0.0017	0.0001	-0.0117
ALV2 to STHR	LoopTie	Good	-0.0014	0.0005	-0.0143
ALV2 to STHR (2)	Duplicate	Good	-0.0014	0.0007	-0.0094
GBND to STHR	LoopTie	Good	-0.0016	0.0002	-0.0051
GBND to STHR (1)	Duplicate	Good	-0.0013	0.0004	0.0012
SARN to STHR (1)	Duplicate	Good	0.0013	0.0037	-0.0151
SARN to STHR	LoopTie	Good	-0.0005	0.0053	-0.0086
SPAR to STHR	LoopTie	Good	-0.0057	-0.0033	0.0072
LNDN to TEMP18 (1)	Duplicate	Good	-0.0079	-0.0019	-0.0109
A793 to TEMP18	LoopTie	Good	-0.0062	-0.0068	-0.0338
BTFD to TEMP18	LoopTie	Good	-0.0121	-0.0004	0.0268
SMCO to TEMP18	LoopTie	Good	0.0029	-0.0172	0.0045
SPAR to TEMP18	LoopTie	Good	-0.0121	-0.0115	-0.0298
POINT WALL	CheckPnt	Good	0.0079	0.0094	-0.0170
ALV2 to WALL (2)	Duplicate	Good	0.0015	-0.0023	-0.0060
71U080 to WALL	LoopTie	Good	-0.0221	0.0022	0.0132
71U080 to WALL (2)	Duplicate	Good	-0.0149	-0.0031	0.0087
81U111 to WALL	LoopTie	Good	0.0015	0.0007	0.0017
A792 to WALL	LoopTie	Good	0.0016	-0.0027	-0.0012
A792 to WALL (2)	Duplicate	Good	-0.0016	0.0030	-0.0058
CHA2 to WALL	LoopTie	Good	-0.0028	0.0106	0.0150
CHA2 to WALL (2)	Duplicate	Good	-0.0027	0.0114	0.0139
LEAM to WALL (1)	Duplicate	Good	-0.0146	-0.0029	0.0172
LEAM to WALL	LoopTie	Good	-0.0196	-0.0007	0.0184
M053006 to WALL	LoopTie	Good	-0.0007	0.0122	-0.0005
SARN to WALL	LoopTie	Good	0.0001	0.0008	0.0055
SARN to WALL (2)	Duplicate	Good	0.0012	0.0013	0.0036
POINT WLOR	CheckPnt	Good	0.0057	-0.0006	-0.0035
LNDN to WLOR (1)	Duplicate	Good	-0.0025	0.0046	0.0139
71U080 to WLOR	LoopTie	Good	-0.0147	-0.0022	0.0069
71U080 to WLOR (2)	Duplicate	Good	-0.0099	-0.0015	0.0100
A792 to WLOR	LoopTie	Good	0.0032	0.0044	-0.0138
A792 to WLOR (2)	Duplicate	Good	0.0057	0.0059	-0.0048
ALV2 to WLOR	LoopTie	Good	-0.0012	-0.0002	-0.0027
ALV2 to WLOR (2)	Duplicate	Good	0.0035	0.0062	0.0005
CHA2 to WLOR	LoopTie	Good	-0.0023	0.0023	-0.0075
CHA2 to WLOR (2)	Duplicate	Good	0.0018	0.0185	0.0125
SPAR to WLOR	LoopTie	Good	-0.0053	-0.0061	0.0022
SPAR to WLOR (1)	Duplicate	Good	-0.0074	-0.0118	0.0054
STHR to WLOR	LoopTie	Good	-0.0005	0.0001	0.0105
POINT WNR2	CheckPnt	Good	0.0110	-0.0061	-0.0405
CHA2 to WNR2	LoopTie	Good	-0.0022	0.0051	0.0241
CHA2 to WNR2 (2)	Duplicate	Good	0.0011	0.0049	0.0145
WALL to WNR2	LoopTie	Good	0.0023	-0.0033	0.0068
71U117 to WNR2	LoopTie	Good	-0.0057	0.0048	0.0211
AMHG to WNR2	LoopTie	Good	-0.0191	-0.0117	0.0097
LEAM to WNR2	LoopTie	Good	-0.0076	-0.0075	0.0078
M053006 to WNR2	LoopTie	Good	0.0005	0.0011	0.0228

RMS (tie points)			0.0082	0.0082	0.0171
RMS (check points)			0.0115	0.0089	0.0261
			=====		

d.) Minimally Constrained Network Adjustment

Network - Map

Geographic, DMS



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*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* *
* (c) Copyright NovAtel Inc., (2014) *
* *
* Version: 8.50.4320 *
* *
* FILE: P:\1638_OMAFRA_LakeErie_2018\20180102_FieldData\Control Network\Mer
ged\1638_OMAFRA_LakeErie_Merged.net
*****
```

DATE(m/d/y): Tue. 1/08/19 TIME: 8:07:01

DATUM: 'NAD83(CSRs)'
GRID: UTM, Zone 17
SCALE_FACTOR: 2.1500
CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

INPUT CONTROL/CHECK POINTS

STA_ID	TYPE	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	HZ-SD	V-SD
71U080	CHK-3D	42 14 49.59904	-82 05 58.54502	162.859		
71U117	CHK-3D	42 08 39.34124	-83 06 50.10631	140.971		
81U111	CHK-3D	42 43 46.11223	-82 28 37.51044	142.005		
843025	CHK-3D	43 32 32.82473	-80 31 05.45601	301.951		
84U149	CHK-3D	43 08 19.64841	-80 42 00.02719	263.529		
883066	CHK-3D	42 47 05.69381	-80 36 40.80565	195.420		
A793	CHK-3D	42 46 34.46795	-81 06 18.30478	199.232		
ALV2	CHK-3D	42 49 09.89974	-81 52 09.15320	194.876		
AMHG	CHK-3D	42 02 12.05150	-82 59 05.23673	159.811		
BTFD	CHK-3D	43 09 37.42136	-80 19 45.02435	215.714		
BURL	CHK-3D	43 21 40.23595	-79 47 28.50748	87.886		
CHA2	CHK-3D	42 24 21.82079	-82 11 08.73431	158.660		
DNV2	CHK-3D	42 54 46.35580	-79 35 03.43338	152.050		
FLSH	CHK-3D	44 15 31.37909	-80 30 17.01023	452.804		
GBND	CHK-3D	43 22 00.57951	-81 39 56.66290	186.993		
GLP2	CHK-3D	43 32 28.50945	-80 18 21.64609	315.118		
LEAM	CHK-3D	42 03 21.79094	-82 35 18.98599	160.082		
LNDN	GCP-3D	42 59 39.08805	-81 14 38.90100	218.558	0.00500	0.00500
LSW2	CHK-3D	43 44 32.73903	-80 56 46.44857	359.647		
M053004	CHK-3D	43 17 58.42094	-79 47 36.67808	40.073		
M053006	CHK-3D	42 01 38.54138	-82 44 03.76731	140.108		
OHSB	CHK-3D	41 38 11.21603	-82 49 47.18029	148.352		
ORVL	CHK-3D	43 53 52.49053	-80 06 44.11646	428.204		
SARN	CHK-3D	42 58 53.51910	-82 24 10.41411	159.121		
SMCO	CHK-3D	42 50 17.50056	-80 21 02.37798	203.578		
SPAR	CHK-3D	42 44 01.37585	-81 04 51.83246	206.638		
STFD	CHK-3D	43 21 56.41429	-80 57 46.36285	332.900		
STHR	CHK-3D	42 58 41.32038	-81 37 45.57296	209.450		
WALL	CHK-3D	42 37 08.25817	-82 26 49.33882	147.777		
WLOR	CHK-3D	42 35 17.34196	-81 35 16.94022	185.653		
WNR2	CHK-3D	42 18 30.71917	-83 01 00.48626	158.760		

INPUT VECTORS

SESSION NAME	VECTOR(m) DX/DY/DZ	----- Covariance (m) [unscaled] ----- standard deviations in brackets
71U080 to A792 (1)	1172.1771 5134.2079 5412.4588	8.9863e-007 (0.0009) -5.7278e-007 4.7817e-006 (0.0022) 3.3417e-007 -2.3139e-006 3.2261e-006 (0.0018)
71U080 to A792 (3)	1172.1743 5134.2019 5412.4625	8.2957e-007 (0.0009) -4.9624e-007 3.9426e-006 (0.0020) 2.1710e-007 -1.5901e-006 2.6392e-006 (0.0016)
ALV2 to 71U080 (1)	-12753.2070 -45174.0508 -46869.3727	1.3075e-005 (0.0036) 5.5880e-007 4.4006e-006 (0.0021) 1.3676e-006 -2.1547e-006 2.8231e-006 (0.0017)
ALV2 to 71U080 (2)	-12753.1888 -45174.0429 -46869.3747	5.0240e-006 (0.0022) 5.9058e-007 7.0652e-006 (0.0027) 1.6677e-007 -2.6833e-006 3.6126e-006 (0.0019)
71U080 to CHA2 (2)	-8661.3495 10809.6568 13051.0496	5.7608e-007 (0.0008) -3.1305e-007 2.7623e-006 (0.0017) 1.0623e-007 -1.1409e-006 1.8076e-006 (0.0013)
71U080 to LEAM (2)	-38162.0934 -19498.0236 -15735.6296	8.5558e-006 (0.0029) 3.2981e-006 3.5858e-005 (0.0060) 6.2354e-006 -1.5259e-006 3.1419e-005 (0.0056)
71U080 to WALL (1)	-32079.4439 23784.6743 30476.8799	2.0967e-005 (0.0046) -2.7593e-005 5.3940e-005 (0.0073) 1.0637e-005 -1.7380e-005 1.4446e-005 (0.0038)
71U080 to WALL (2)	-32079.4511 23784.6736 30476.8868	1.2083e-006 (0.0011) -7.4787e-007 5.7389e-006 (0.0024) 2.8781e-007 -2.2969e-006 3.7758e-006 (0.0019)
71U080 to WLOR (1)	38056.5815 31252.1365 27983.2874	1.3372e-006 (0.0012) -9.7506e-007 7.0117e-006 (0.0026) 6.5299e-007 -3.4459e-006 4.8756e-006 (0.0022)
71U080 to WLOR (2)	38056.5764 31252.1376 27983.2848	6.5798e-006 (0.0026) -4.0949e-006 2.2928e-005 (0.0048) 5.9082e-006 -6.8181e-006 1.6565e-005 (0.0041)
71U117 to AMHG (1)	11576.1187 -6672.0850 -8855.1810	2.5011e-006 (0.0016) -2.1910e-006 6.6370e-006 (0.0026) 9.2128e-007 -3.1501e-006 3.9484e-006 (0.0020)
M053006 to 71U117 (1)	-32236.0926 4766.9192 9636.3241	9.6878e-006 (0.0031) -8.2570e-006 6.1645e-005 (0.0079) 6.2943e-006 -2.7222e-005 5.1019e-005 (0.0071)
71U117 to OHSB (1)	28013.9920 -34498.5294 -41983.8736	3.3368e-005 (0.0058) -1.1580e-007 2.4780e-005 (0.0050) -2.1189e-007 -7.1236e-006 1.1884e-005 (0.0034)
71U117 to WNR2 (1)	6480.0792 13128.6118 13523.9974	2.1664e-006 (0.0015) -1.4416e-006 8.3699e-006 (0.0029) 1.5668e-006 -3.3707e-006 6.4861e-006 (0.0025)
ALV2 to 81U111 (1)	-48366.6698 -13458.5312 -7370.1114	9.8198e-006 (0.0031) 6.8538e-007 6.0449e-005 (0.0078) -4.6744e-006 -1.6781e-005 5.4558e-005 (0.0074)
81U111 to CHA2 (1)	26952.1206 -20905.8627 -26448.2231	3.5646e-006 (0.0019) -2.9399e-007 1.9482e-005 (0.0044) -9.9042e-007 -5.6944e-006 1.9741e-005 (0.0044)

81U111 to SARN (1)	3507.3277	4.7334e-007	(0.0007)
	19665.2431	-2.4866e-007	2.3624e-006 (0.0015)
	20538.8660	1.6104e-007	-1.1076e-006 1.7215e-006 (0.0013)
81U111 to WALL (1)	3534.0147	3.4698e-007	(0.0006)
	-7930.8479	-2.1575e-007	1.5717e-006 (0.0013)
	-9022.3746	1.1808e-007	-7.1730e-007 1.0938e-006 (0.0010)
81U111 to WNR2 (1)	-40004.9335	4.6065e-005	(0.0068)
	-36960.9282	1.7984e-006	2.2313e-005 (0.0047)
	-34453.8356	-4.1489e-007	-7.4408e-006 1.2704e-005 (0.0036)
843025 to BURL (1)	60315.0244	4.1718e-006	(0.0020)
	-3433.2191	-2.5938e-006	1.0753e-005 (0.0033)
	-14768.2759	2.7302e-006	-7.4795e-006 1.4394e-005 (0.0038)
843025 to GLP2 (2)	16925.8396	1.0292e-006	(0.0010)
	2756.4009	-6.2940e-007	5.0842e-006 (0.0023)
	-87.4787	4.2323e-007	-3.9042e-006 5.0161e-006 (0.0022)
843025 to M053004 (1)	60960.1797	3.2821e-006	(0.0018)
	-8054.6616	-1.0589e-007	2.9186e-006 (0.0017)
	-19780.5493	4.0744e-007	-1.6021e-006 2.1922e-006 (0.0015)
84U149 to 843025 (1)	9529.0426	3.2531e-006	(0.0018)
	32746.6249	-4.6664e-007	2.6510e-006 (0.0016)
	32643.9113	3.8468e-007	-1.4388e-006 1.8488e-006 (0.0014)
84U149 to 883066 (2)	11481.3532	3.8542e-005	(0.0062)
	-25213.5719	-1.8987e-005	7.0891e-005 (0.0084)
	-28816.8455	3.8878e-006	-3.6525e-005 4.4960e-005 (0.0067)
84U149 to BTFD (2)	29477.0691	2.1331e-005	(0.0046)
	6624.6801	3.5920e-006	1.1108e-004 (0.0105)
	1718.3547	-4.5515e-006	-4.6595e-005 3.7655e-005 (0.0061)
84U149 to SPAR (2)	-25865.8158	7.8330e-007	(0.0009)
	-35151.2860	-4.1044e-007	3.0241e-006 (0.0017)
	-32985.2975	3.0771e-007	-1.8156e-006 2.4441e-006 (0.0016)
84U149 to STFD (1)	-23819.1443	1.3363e-005	(0.0037)
	13599.9121	-7.6311e-006	3.2997e-005 (0.0057)
	18406.8689	-3.5920e-009	-1.9340e-005 2.8396e-005 (0.0053)
883066 to BTFD (1)	17995.7100	5.1229e-006	(0.0023)
	31838.2186	-1.0086e-006	2.6230e-006 (0.0016)
	30535.2110	5.8512e-007	-1.5137e-006 1.8908e-006 (0.0014)
883066 to BTFD (2)	17995.7078	2.6980e-006	(0.0016)
	31838.2149	-1.2603e-007	1.6423e-006 (0.0013)
	30535.2090	3.2538e-007	-1.0067e-006 1.2944e-006 (0.0011)
883066 to SPAR (2)	-37347.1593	3.4749e-006	(0.0019)
	-9937.7372	9.7183e-007	1.3345e-005 (0.0037)
	-4168.4577	-3.4459e-007	-6.2855e-006 1.1841e-005 (0.0034)
A535 to GLP2 (1)	5492.9613	1.0869e-006	(0.0010)
	7580.5673	-9.0249e-007	3.7058e-006 (0.0019)
	6962.2637	3.7939e-007	-1.3353e-006 2.3499e-006 (0.0015)
A535 to GLP2 (2)	5492.9543	5.8236e-007	(0.0008)
	7580.5650	-3.6315e-007	2.5039e-006 (0.0016)
	6962.2622	2.2241e-007	-1.1986e-006 2.0365e-006 (0.0014)
A535 to LSW2 (2)	-47984.6540	2.1533e-006	(0.0015)
	14355.0567	-1.9090e-006	7.7869e-006 (0.0028)

	23168.9602	9.6028e-007	-3.7469e-006	5.7920e-006	(0.0024)
A535 to ORVL (2)	16236.2618	1.4111e-005	(0.0038)		
	37145.6199	-2.4137e-005	1.0733e-004	(0.0104)	
	35682.0669	1.3524e-005	-3.3573e-005	3.9448e-005	(0.0063)
ALV2 to A792 (1)	-11581.0267	1.9040e-005	(0.0044)		
	-40039.8552	-1.3817e-005	6.2799e-005	(0.0079)	
	-41456.9091	5.3595e-006	-3.4310e-005	4.3880e-005	(0.0066)
ALV2 to A792 (2)	-11581.0236	1.6790e-005	(0.0041)		
	-40039.8475	-8.1534e-006	4.6151e-005	(0.0068)	
	-41456.9071	1.0785e-005	-1.9055e-005	3.9580e-005	(0.0063)
A792 to CHA2 (1)	-9833.5285	4.8741e-007	(0.0007)		
	5675.4587	-2.4782e-007	2.5886e-006	(0.0016)	
	7638.5891	1.0256e-007	-1.2215e-006	1.7650e-006	(0.0013)
A792 to CHA2 (2)	-9833.5227	4.6098e-007	(0.0007)		
	5675.4531	-2.0432e-007	2.1815e-006	(0.0015)	
	7638.5885	7.8973e-008	-9.4031e-007	1.5529e-006	(0.0012)
A792 to LEAM (1)	-39334.2727	3.7166e-006	(0.0019)		
	-24632.2261	-5.0180e-006	2.8882e-005	(0.0054)	
	-21148.0877	1.9377e-006	-1.0739e-005	1.1976e-005	(0.0035)
A792 to LEAM (2)	-39334.2687	4.2180e-006	(0.0021)		
	-24632.2307	-1.7361e-006	1.7153e-005	(0.0041)	
	-21148.0828	2.0924e-006	-6.6560e-006	1.2501e-005	(0.0035)
A792 to WALL (1)	-33251.6286	6.0359e-006	(0.0025)		
	18650.4762	-2.2606e-006	2.2196e-005	(0.0047)	
	25064.4276	-1.2628e-006	-5.4675e-006	1.2572e-005	(0.0035)
A792 to WALL (2)	-33251.6245	1.0349e-006	(0.0010)		
	18650.4695	-5.3951e-007	4.8485e-006	(0.0022)	
	25064.4265	2.3830e-007	-2.0213e-006	3.4666e-006	(0.0019)
A792 to WLOR (1)	36884.4045	1.2150e-006	(0.0011)		
	26117.9267	-7.4974e-007	6.3998e-006	(0.0025)	
	22570.8309	3.3425e-007	-3.0193e-006	4.4711e-006	(0.0021)
A792 to WLOR (2)	36884.4012	4.5397e-006	(0.0021)		
	26117.9318	-2.3558e-006	1.8337e-005	(0.0043)	
	22570.8237	3.9673e-006	-4.6792e-006	1.2223e-005	(0.0035)
A793 to SPAR (2)	2440.1384	1.9550e-007	(0.0004)		
	-2869.3670	-6.0712e-008	8.4479e-007	(0.0009)	
	-3463.7902	4.5505e-008	-4.8643e-007	6.6310e-007	(0.0008)
A793 to TEMP18 (2)	31702.2022	2.1677e-006	(0.0015)		
	20260.7940	9.0493e-007	1.0600e-005	(0.0033)	
	16201.7380	5.2661e-007	-4.7184e-006	5.6872e-006	(0.0024)
A822 to FLSH (2)	-2469.7746	1.9174e-006	(0.0014)		
	31848.2285	-2.3033e-006	9.5743e-006	(0.0031)	
	32929.2001	1.4396e-006	-5.0558e-006	6.2158e-006	(0.0025)
A822 to GLP2 (1)	22469.4402	1.3820e-006	(0.0012)		
	-19898.8677	-1.3285e-006	8.0705e-006	(0.0028)	
	-24609.9685	5.2099e-007	-3.2023e-006	4.6824e-006	(0.0022)
A822 to LSW2 (1)	-31008.1834	1.3561e-005	(0.0037)		
	-13124.3492	-2.7648e-005	1.4804e-004	(0.0122)	
	-8403.2834	1.0853e-005	-5.5759e-005	3.9948e-005	(0.0063)
A822 to ORVL (1)	33212.7439	7.0650e-006	(0.0027)		

	9666.1979	-3.1769e-006	2.4605e-005	(0.0050)
	4109.8197	2.7434e-007	-7.5427e-006	1.2057e-005 (0.0035)
A824 to BURL (2)	9123.5762	2.4270e-006	(0.0016)	
	30138.3330	-1.1928e-007	1.2120e-006	(0.0011)
	29793.0969	2.3980e-007	-7.1529e-007	9.2880e-007 (0.0010)
A824 to DNV2 (2)	31794.7753	6.4491e-006	(0.0025)	
	-397.1095	-6.8778e-007	1.8236e-005	(0.0043)
	-6506.7198	8.4751e-007	-1.5133e-005	2.0315e-005 (0.0045)
ALV2 to CHA2 (1)	-21414.5486	4.3201e-006	(0.0021)	
	-34364.3917	-7.2320e-007	2.2240e-005	(0.0047)
	-33818.3399	-7.7955e-007	-6.8807e-006	2.4247e-005 (0.0049)
ALV2 to CHA2 (2)	-21414.5502	4.1756e-006	(0.0020)	
	-34364.3930	-3.1912e-006	1.7756e-005	(0.0042)
	-33818.3223	1.2803e-006	-1.0968e-005	1.8722e-005 (0.0043)
ALV2 to GBND (1)	10445.4031	9.4651e-006	(0.0031)	
	43498.2396	1.1526e-006	7.2008e-006	(0.0027)
	44405.1475	3.4952e-007	-1.9467e-006	3.3286e-006 (0.0018)
ALV2 to GBND (2)	10445.4063	8.7272e-007	(0.0009)	
	43498.2490	7.0412e-008	7.8873e-007	(0.0009)
	44405.1389	5.3465e-008	-3.9424e-007	4.7562e-007 (0.0007)
ALV2 to SARN (1)	-44859.3413	3.7523e-006	(0.0019)	
	6206.7111	-6.6817e-007	1.9201e-005	(0.0044)
	13168.7563	-6.1806e-007	-5.9528e-006	2.0972e-005 (0.0046)
ALV2 to SARN (2)	-44859.3402	3.6603e-006	(0.0019)	
	6206.7128	-2.8184e-006	1.5479e-005	(0.0039)
	13168.7547	1.1338e-006	-9.5358e-006	1.6295e-005 (0.0040)
ALV2 to SPAR (1)	64747.0745	9.7166e-006	(0.0031)	
	3158.5259	1.2132e-006	7.3437e-006	(0.0027)
	-6980.2624	3.8683e-007	-1.9727e-006	3.3758e-006 (0.0018)
ALV2 to SPAR (2)	64747.0806	8.4602e-006	(0.0029)	
	3158.5288	9.0828e-007	6.8231e-006	(0.0026)
	-6980.2646	3.6271e-007	-1.8178e-006	3.0242e-006 (0.0017)
ALV2 to STHR (1)	17669.1699	3.7798e-007	(0.0006)	
	14680.2538	-3.0375e-007	1.6127e-006	(0.0013)
	12927.6701	1.4926e-007	-7.3771e-007	1.0851e-006 (0.0010)
ALV2 to STHR (2)	17669.1694	3.4206e-007	(0.0006)	
	14680.2572	-2.2819e-007	1.5478e-006	(0.0012)
	12927.6666	1.3931e-007	-6.7593e-007	1.0777e-006 (0.0010)
ALV2 to WALL (1)	-44832.6536	4.2749e-006	(0.0021)	
	-21389.3797	-7.2843e-007	2.2027e-005	(0.0047)
	-16392.4843	-7.5735e-007	-6.7987e-006	2.3965e-005 (0.0049)
ALV2 to WALL (2)	-44832.6547	2.7630e-006	(0.0017)	
	-21389.3827	1.0128e-008	1.7132e-005	(0.0041)
	-16392.4786	-1.3575e-006	-1.1410e-005	2.3251e-005 (0.0048)
ALV2 to WLOR (1)	25303.3805	3.8390e-007	(0.0006)	
	-13921.9167	-2.3056e-007	1.6870e-006	(0.0013)
	-18886.0823	1.4334e-007	-7.9421e-007	1.2648e-006 (0.0011)
ALV2 to WLOR (2)	25303.3761	2.6630e-006	(0.0016)	
	-13921.9194	-2.0706e-006	1.1160e-005	(0.0033)
	-18886.0892	8.5141e-007	-6.9603e-006	1.1872e-005 (0.0034)

LEAM to AMHG (1)	-32360.2689	6.8438e-006	(0.0026)
	-5548.0710	-6.1839e-006	2.3416e-005 (0.0048)
	-1598.1143	3.5826e-006	-1.6705e-005 2.3276e-005 (0.0048)
LEAM to AMHG (2)	-32360.2736	1.0824e-006	(0.0010)
	-5548.0754	-6.1168e-007	6.1608e-006 (0.0025)
	-1598.1215	5.4292e-007	-3.1478e-006 4.3754e-006 (0.0021)
AMHG to M053006 (1)	20659.9782	8.1998e-007	(0.0009)
	1905.1706	-4.0207e-007	3.9195e-006 (0.0020)
	-781.1506	2.0693e-007	-1.7209e-006 2.9009e-006 (0.0017)
AMHG to OHSB (1)	16437.8676	1.0180e-005	(0.0032)
	-27826.4349	-2.5796e-006	7.2432e-005 (0.0085)
	-33128.7106	-2.2393e-007	-4.2287e-005 5.7541e-005 (0.0076)
AMHG to OHSB (2)	16437.8714	7.4071e-006	(0.0027)
	-27826.4456	5.4780e-006	1.1417e-004 (0.0107)
	-33128.7017	-1.7225e-006	-3.5387e-005 4.0439e-005 (0.0064)
AMHG to WNR2 (1)	-5096.0351	1.0755e-006	(0.0010)
	19800.6954	-8.7437e-007	6.2640e-006 (0.0025)
	22379.1736	4.6160e-007	-2.2017e-006 4.3524e-006 (0.0021)
BTFD to 843025 (1)	-19948.0197	2.8709e-006	(0.0017)
	26121.9720	-1.2230e-006	1.0453e-005 (0.0032)
	30925.5435	1.1652e-006	-7.2002e-006 9.1152e-006 (0.0030)
BTFD to M053004 (2)	41012.1491	4.6623e-006	(0.0022)
	18067.2994	-1.6086e-006	1.8610e-005 (0.0043)
	11144.9971	1.0637e-006	-1.3346e-005 1.6287e-005 (0.0040)
BTFD to SMCO (5)	2367.5934	4.1273e-006	(0.0020)
	-24351.1001	-4.8475e-007	2.1334e-005 (0.0046)
	-26187.5436	3.8849e-006	-1.1393e-005 1.7437e-005 (0.0042)
STFD to BTFD (1)	53296.2147	1.7359e-005	(0.0042)
	-6975.2703	-2.9929e-006	9.7434e-005 (0.0099)
	-16688.4956	2.2622e-006	-5.2304e-005 5.7002e-005 (0.0075)
BTFD to TEMP18 (2)	-26080.8140	7.9965e-006	(0.0028)
	-18645.8005	-4.4390e-007	4.3837e-005 (0.0066)
	-15038.1410	-2.9693e-008	-3.5193e-005 4.2458e-005 (0.0065)
BURL to GLP2 (3)	-43389.1893	2.6380e-006	(0.0016)
	6189.6217	3.9783e-008	1.4180e-006 (0.0012)
	14680.7947	2.6701e-007	-7.5783e-007 9.7050e-007 (0.0010)
BURL to M053004 (1)	645.1499	9.5785e-007	(0.0010)
	-4621.4482	-6.2898e-007	4.6041e-006 (0.0021)
	-5012.2748	6.0240e-007	-3.5372e-006 4.2264e-006 (0.0021)
BURL to M053004 (2)	645.1468	1.0228e-006	(0.0010)
	-4621.4490	-3.9027e-007	3.7998e-006 (0.0019)
	-5012.2669	3.1433e-007	-2.5139e-006 3.4460e-006 (0.0019)
CHA2 to LEAM (1)	-29500.7441	5.3386e-006	(0.0023)
	-30307.6873	1.3838e-008	4.2763e-005 (0.0065)
	-28786.6708	6.8465e-006	-1.5397e-005 4.4751e-005 (0.0067)
CHA2 to LEAM (2)	-29500.7461	8.9551e-006	(0.0030)
	-30307.6844	-3.6303e-006	3.9940e-005 (0.0063)
	-28786.6801	1.0520e-006	-2.6579e-005 3.9337e-005 (0.0063)
CHA2 to M053006 (1)	-41201.0371	3.0541e-006	(0.0017)
	-33950.5857	2.7215e-007	3.2928e-006 (0.0018)
	-31165.9464	-4.4010e-008	-1.5719e-006 2.0192e-006 (0.0014)

CHA2 to SARN (1)	-23444.7960	9.5786e-006	(0.0031)
	40571.0998	9.6858e-007	7.1958e-006 (0.0027)
	46987.0818	2.9060e-007	-2.0099e-006 3.3620e-006 (0.0018)
CHA2 to SARN (2)	-23444.7863	8.8167e-007	(0.0009)
	40571.1029	5.7495e-008	8.0776e-007 (0.0009)
	46987.0823	4.0669e-008	-4.1116e-007 4.8743e-007 (0.0007)
CHA2 to WALL (1)	-23418.1027	3.6040e-007	(0.0006)
	12975.0162	-1.8262e-007	1.6327e-006 (0.0013)
	17425.8377	1.0974e-007	-7.7318e-007 1.1982e-006 (0.0011)
CHA2 to WALL (2)	-23418.1027	3.3714e-007	(0.0006)
	12975.0149	-1.7448e-007	1.5933e-006 (0.0013)
	17425.8378	1.0631e-007	-7.4205e-007 1.1206e-006 (0.0011)
CHA2 to WLOR (1)	46717.9310	4.3658e-006	(0.0021)
	20442.4699	-7.1913e-007	2.2480e-005 (0.0047)
	14932.2590	-8.1549e-007	-6.9904e-006 2.4594e-005 (0.0050)
CHA2 to WLOR (2)	46717.9263	4.2685e-006	(0.0021)
	20442.4731	-3.2920e-006	1.8244e-005 (0.0043)
	14932.2335	1.3297e-006	-1.1359e-005 1.9266e-005 (0.0044)
CHA2 to WNR2 (1)	-66957.0543	3.4730e-006	(0.0019)
	-16055.0532	4.3023e-008	2.4635e-006 (0.0016)
	-8005.6271	2.2690e-007	-1.2947e-006 1.5768e-006 (0.0013)
CHA2 to WNR2 (2)	-66957.0567	2.2436e-005	(0.0047)
	-16055.0605	2.8480e-006	1.6210e-005 (0.0040)
	-8005.6205	4.9122e-007	-4.5642e-006 7.5521e-006 (0.0027)
FLSH to LSW2 (2)	-28538.4064	3.4290e-006	(0.0019)
	-44972.6003	-5.2881e-006	2.6055e-005 (0.0051)
	-41332.4672	1.7216e-006	-7.8937e-006 8.2205e-006 (0.0029)
FLSH to ORVL (1)	35682.5127	1.2480e-006	(0.0011)
	-22182.0289	-7.5195e-007	4.6405e-006 (0.0022)
	-28819.3781	4.3867e-007	-2.4661e-006 4.5125e-006 (0.0021)
GBND to LSW2 (1)	53144.7504	5.3368e-006	(0.0023)
	37089.1043	-6.3645e-006	1.8615e-005 (0.0043)
	30363.0134	4.5111e-006	-1.0220e-005 1.4004e-005 (0.0037)
GBND to SARN (1)	-55304.7412	1.0113e-005	(0.0032)
	-37291.5284	1.1876e-006	7.7298e-006 (0.0028)
	-31236.3889	3.7755e-007	-2.0960e-006 3.5854e-006 (0.0019)
GBND to STHR (1)	7223.7642	5.7098e-007	(0.0008)
	-28817.9898	-4.5931e-007	2.4169e-006 (0.0016)
	-31477.4763	2.2724e-007	-1.1137e-006 1.6545e-006 (0.0013)
GBND to STHR (2)	7223.7651	5.1635e-007	(0.0007)
	-28817.9942	-3.4567e-007	2.3206e-006 (0.0015)
	-31477.4718	2.1227e-007	-1.0213e-006 1.6439e-006 (0.0013)
GLP2 to M053004 (1)	44034.3372	2.0747e-006	(0.0014)
	-10811.0702	-1.1380e-006	7.3098e-006 (0.0027)
	-19693.0702	1.0369e-006	-4.5721e-006 6.6676e-006 (0.0026)
GLP2 to LSW2 (1)	-53477.6192	2.0208e-006	(0.0014)
	6774.4942	-1.8234e-006	7.0936e-006 (0.0027)
	16206.6964	9.1223e-007	-3.5007e-006 5.3719e-006 (0.0023)
GLP2 to ORVL (2)	10743.3011	8.2447e-006	(0.0029)
	29565.0747	-6.6569e-006	4.0798e-005 (0.0064)

	28719.7818	4.1508e-006	-1.6711e-005	2.4302e-005	(0.0049)
LEAM to M053006 (1)	-11700.2938	6.3896e-007	(0.0008)		
	-3642.9013	-3.2659e-007	3.0422e-006	(0.0017)	
	-2379.2771	1.7959e-007	-1.3302e-006	2.2190e-006	(0.0015)
LEAM to OHSB (1)	-15922.3975	1.6504e-005	(0.0041)		
	-33374.5009	-7.5214e-006	6.8302e-005	(0.0083)	
	-34726.8303	6.9195e-006	-3.4549e-005	3.4805e-005	(0.0059)
LEAM to WALL (1)	6082.6412	9.7021e-006	(0.0031)		
	43282.7033	1.2232e-006	7.3289e-006	(0.0027)	
	46212.5105	3.8552e-007	-1.9112e-006	3.2980e-006	(0.0018)
LEAM to WALL (2)	6082.6462	8.3641e-006	(0.0029)		
	43282.7033	8.3198e-007	6.7621e-006	(0.0026)	
	46212.5081	3.3120e-007	-1.7971e-006	2.9661e-006	(0.0017)
LEAM to WNR2 (1)	-37456.3149	8.0954e-006	(0.0028)		
	14252.6188	4.3704e-006	7.0129e-005	(0.0084)	
	20781.0576	-5.1342e-006	-2.6088e-005	4.5271e-005	(0.0067)
LNDN to 84U149 (1)	42057.4092	2.5504e-005	(0.0051)		
	17756.2791	-5.3442e-006	5.1910e-005	(0.0072)	
	11767.0426	4.1043e-006	-2.3120e-005	3.8390e-005	(0.0062)
LNDN to A793 (1)	13751.4628	7.4898e-006	(0.0027)		
	-14525.6757	8.0938e-007	2.9800e-005	(0.0055)	
	-17754.4357	-3.3896e-007	-1.8497e-005	2.2678e-005	(0.0048)
LNDN to ALV2 (1)	-48555.4744	2.3946e-006	(0.0015)		
	-20553.5694	-1.0561e-006	8.2037e-006	(0.0029)	
	-14237.9662	6.3237e-008	-3.0372e-006	7.5617e-006	(0.0027)
LNDN to GBND (2)	-38110.0704	1.1133e-006	(0.0011)		
	22944.6855	-7.0374e-007	5.0242e-006	(0.0022)	
	30167.1696	4.3876e-007	-2.3298e-006	3.7038e-006	(0.0019)
LNDN to SPAR (1)	16191.6041	5.3990e-006	(0.0023)		
	-17395.0319	2.3440e-006	3.2863e-005	(0.0057)	
	-21218.2254	1.5283e-007	-1.4691e-005	2.3541e-005	(0.0049)
LNDN to SPAR (2)	16191.6041	5.3990e-006	(0.0023)		
	-17395.0318	2.3440e-006	3.2863e-005	(0.0057)	
	-21218.2254	1.5283e-007	-1.4691e-005	2.3541e-005	(0.0049)
LNDN to STFD (2)	18238.2594	1.2384e-006	(0.0011)		
	31356.1844	1.1630e-008	1.1670e-006	(0.0011)	
	30173.9202	8.5244e-008	-5.7051e-007	6.9362e-007	(0.0008)
LNDN to STHR (1)	-30886.3075	3.8467e-007	(0.0006)		
	-5873.3051	-2.9388e-007	1.7588e-006	(0.0013)	
	-1310.3055	1.5262e-007	-8.1475e-007	1.2197e-006	(0.0011)
LNDN to TEMP18 (1)	45453.6645	1.1638e-006	(0.0011)		
	5735.1318	-4.5155e-007	4.7244e-006	(0.0022)	
	-1552.7168	3.2498e-007	-2.9184e-006	4.1653e-006	(0.0020)
LNDN to TEMP18 (2)	45453.6556	2.2437e-006	(0.0015)		
	5735.1372	-3.6890e-007	9.6535e-006	(0.0031)	
	-1552.7257	6.9504e-007	-6.1060e-006	8.2060e-006	(0.0029)
LNDN to WLOR (1)	-23252.0940	4.3676e-006	(0.0021)		
	-34475.4771	-8.3601e-007	2.2283e-005	(0.0047)	
	-33124.0633	-7.3310e-007	-7.0797e-006	2.5002e-005	(0.0050)
LNDN to WLOR (2)	-23252.0954	3.8303e-006	(0.0020)		

	-34475.4845	-3.8658e-006	1.8626e-005	(0.0043)
	-33124.0505	6.7266e-007	-8.1433e-006	1.1860e-005 (0.0034)
M053006 to OHSB (1)	-4222.1027	1.3630e-005		(0.0037)
	-29731.5933	3.1996e-006	1.1558e-004	(0.0108)
	-32347.5665	-3.9743e-006	-5.2141e-005	4.2344e-005 (0.0065)
M053006 to WALL (1)	17782.9340	1.5739e-005		(0.0040)
	46925.5893	1.0074e-006	1.3846e-005	(0.0037)
	48591.7934	1.1382e-007	-3.8569e-006	6.2033e-006 (0.0025)
M053006 to WNR2 (1)	-25756.0200	1.6647e-005		(0.0041)
	17895.5340	1.2709e-006	9.4209e-005	(0.0097)
	23160.3231	-9.7497e-006	-3.5578e-005	4.6115e-005 (0.0068)
SARN to STHR (1)	62528.5089	1.0266e-005		(0.0032)
	8473.5396	1.8838e-006	8.5196e-006	(0.0029)
	-241.0880	2.6957e-007	-2.1807e-006	3.6525e-006 (0.0019)
SARN to STHR (2)	62528.5102	1.0431e-005		(0.0032)
	8473.5435	1.3329e-006	7.5956e-006	(0.0028)
	-241.0936	3.3302e-007	-2.1296e-006	3.5649e-006 (0.0019)
SARN to WALL (1)	26.6871	4.3060e-007		(0.0007)
	-27596.0873	-2.4160e-007	1.9182e-006	(0.0014)
	-29561.2449	1.4908e-007	-9.0324e-007	1.4505e-006 (0.0012)
SARN to WALL (2)	26.6863	4.0163e-007		(0.0006)
	-27596.0892	-2.3500e-007	1.8411e-006	(0.0014)
	-29561.2440	1.4566e-007	-8.4948e-007	1.3471e-006 (0.0012)
SMCO to A824 (3)	28875.8446	7.7030e-006		(0.0028)
	16901.5221	-3.5469e-006	2.5180e-005	(0.0050)
	12551.7267	4.7874e-006	-1.7750e-005	2.3352e-005 (0.0048)
SMCO to DNV2 (3)	60670.6062	2.0825e-005		(0.0046)
	16504.3784	1.8767e-006	1.1489e-005	(0.0034)
	6045.0273	1.1580e-006	-3.5884e-006	6.0363e-006 (0.0025)
SPAR to SMCO (1)	57710.4749	3.1026e-006		(0.0018)
	17424.8539	4.5228e-008	1.6764e-006	(0.0013)
	8516.1174	3.0672e-007	-9.2413e-007	1.1513e-006 (0.0011)
SPAR to SMCO (3)	57710.4804	3.8547e-006		(0.0020)
	17424.8522	1.3464e-007	1.7285e-006	(0.0013)
	8516.1218	2.0313e-007	-9.9031e-007	1.2463e-006 (0.0011)
SMCO to TEMP18 (2)	-28448.4287	1.4471e-004		(0.0120)
	5705.3294	-6.1171e-005	7.8972e-005	(0.0089)
	11149.3917	1.5162e-005	-4.0646e-005	5.4698e-005 (0.0074)
SPAR to STHR (2)	-47077.9071	4.2679e-006		(0.0021)
	11521.7350	-8.4739e-007	2.1723e-005	(0.0047)
	19907.9174	-6.7025e-007	-6.9111e-006	2.4388e-005 (0.0049)
SPAR to TEMP18 (1)	29262.0657	1.5511e-006		(0.0012)
	23130.1572	-6.3261e-007	7.3009e-006	(0.0027)
	19665.5284	9.4707e-007	-5.2228e-006	8.1723e-006 (0.0029)
SPAR to WLOR (1)	-39443.6940	3.5762e-006		(0.0019)
	-17080.4397	-6.9499e-007	1.8255e-005	(0.0043)
	-11905.8201	-6.0038e-007	-5.8144e-006	2.0546e-005 (0.0045)
SPAR to WLOR (2)	-39443.6951	3.1235e-006		(0.0018)
	-17080.4462	-3.1578e-006	1.5183e-005	(0.0039)
	-11905.8221	5.5070e-007	-6.6388e-006	9.6729e-006 (0.0031)

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STFD to 843025 (1)    33348.1981  1.0850e-005 (0.0033)
                      19146.7144 -3.4431e-006 3.1355e-005 (0.0056)
                      14237.0566 3.8789e-006 -2.0248e-005 2.9458e-005 (0.0054)

STFD to A535 (1)     44781.0802  1.3531e-006 (0.0012)
                      14322.5362 -7.9791e-007 5.8632e-006 (0.0024)
                      7187.3142  4.9122e-007 -3.0009e-006 5.1156e-006 (0.0023)

STFD to A822 (1)     27804.5995  2.4946e-006 (0.0016)
                      41801.9593 -2.5556e-007 2.6592e-006 (0.0016)
                      38759.5553 3.9164e-007 -1.3064e-006 1.5307e-006 (0.0012)

STFD to GLP2 (1)     50274.0394  1.2282e-005 (0.0035)
                      21903.1070 -5.7269e-006 8.9112e-005 (0.0094)
                      14149.5747 5.0300e-006 -5.0918e-005 8.5415e-005 (0.0092)

STFD to LSW2 (1)     -3203.5754  2.5317e-006 (0.0016)
                      28677.5986 -2.8484e-006 8.9205e-006 (0.0030)
                      30356.2734 2.7358e-006 -5.6240e-006 1.1522e-005 (0.0034)

STHR to WLOR (1)     7634.2115  5.1184e-007 (0.0007)
                      -28602.1717 -3.9091e-007 2.3403e-006 (0.0015)
                      -31813.7522 2.0535e-007 -1.0863e-006 1.6196e-006 (0.0013)

WALL to WNR2 (2)     -43538.9529  2.3051e-005 (0.0048)
                      -29030.0728 -1.2312e-005 5.3305e-005 (0.0073)
                      -25431.4649 2.1329e-005 -4.1632e-005 7.3160e-005 (0.0086)

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*****
      OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)
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SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
71U080 to A792 (1)	-0.0019	-0.0017	0.0034	0.556	7.6	0.0044
71U080 to A792 (3)	0.0017	-0.0007	-0.0033	0.499	7.6	0.0040
ALV2 to 71U080 (1)	0.0066	-0.0002	-0.0005	0.099	66.3	0.0066
ALV2 to 71U080 (2)	-0.0125	-0.0022	0.0047	0.205	66.3	0.0058
71U080 to CHA2 (2)	0.0004	0.0007	-0.0032	0.171	19.0	0.0033
71U080 to LEAM (2)	-0.0010	0.0024	0.0044	0.111	45.7	0.0128
71U080 to WALL (1)	-0.0076	0.0055	0.0029	0.195	50.2	0.0139
71U080 to WALL (2)	-0.0004	0.0002	-0.0015	0.032	50.2	0.0048
71U080 to WLOR (1)	-0.0013	-0.0011	0.0038	0.073	56.6	0.0053
71U080 to WLOR (2)	0.0036	-0.0004	0.0069	0.137	56.6	0.0100
71U117 to AMHG (1)	-0.0018	0.0020	0.0032	0.262	16.0	0.0053
M053006 to 71U117 (1)	-0.0034	0.0016	0.0046	0.175	34.0	0.0162
71U117 to OHSB (1)	-0.0024	-0.0021	-0.0075	0.134	61.1	0.0123
71U117 to WNR2 (1)	0.0009	-0.0014	-0.0014	0.108	19.9	0.0060
ALV2 to 81U111 (1)	0.0033	0.0022	-0.0024	0.091	50.7	0.0164
81U111 to CHA2 (1)	-0.0035	0.0074	0.0058	0.231	43.2	0.0096
81U111 to SARN (1)	0.0002	0.0000	0.0029	0.102	28.7	0.0031
81U111 to WALL (1)	0.0002	-0.0005	-0.0013	0.113	12.5	0.0025
81U111 to WNR2 (1)	-0.0026	0.0045	-0.0091	0.163	64.4	0.0132
843025 to BURL (1)	0.0035	0.0018	0.0021	0.071	62.2	0.0079
843025 to GLP2 (2)	0.0002	0.0015	-0.0004	0.093	17.1	0.0049
843025 to M053004 (1)	-0.0042	-0.0006	0.0040	0.090	64.6	0.0042
84U149 to 843025 (1)	0.0013	0.0023	0.0002	0.056	47.2	0.0041
84U149 to 883066 (2)	0.0004	0.0130	-0.0119	0.442	40.0	0.0182
84U149 to BTFD (2)	-0.0085	-0.0037	0.0204	0.741	30.3	0.0191
84U149 to SPAR (2)	0.0002	-0.0033	0.0028	0.080	54.7	0.0037
84U149 to STFD (1)	-0.0082	0.0023	-0.0200	0.658	33.0	0.0127
883066 to BTFD (1)	0.0023	-0.0026	0.0017	0.082	47.6	0.0046
883066 to BTFD (2)	0.0051	0.0011	0.0006	0.110	47.6	0.0035
883066 to SPAR (2)	-0.0061	0.0045	0.0008	0.196	38.9	0.0078

A535 to GLP2 (1)	-0.0038	-0.0009	0.0003	0.335	11.7	0.0039
A535 to GLP2 (2)	0.0035	0.0010	0.0005	0.314	11.7	0.0033
A535 to LSW2 (2)	-0.0034	0.0023	-0.0040	0.105	55.2	0.0058
A535 to ORVL (2)	-0.0007	-0.0023	-0.0145	0.272	54.0	0.0186
ALV2 to A792 (1)	0.0033	0.0031	-0.0097	0.182	58.8	0.0164
ALV2 to A792 (2)	-0.0010	-0.0032	-0.0058	0.114	58.8	0.0148
A792 to CHA2 (1)	0.0029	-0.0031	0.0020	0.341	13.7	0.0032
A792 to CHA2 (2)	-0.0021	0.0016	-0.0023	0.257	13.7	0.0030
A792 to LEAM (1)	0.0024	-0.0002	0.0047	0.103	51.0	0.0098
A792 to LEAM (2)	-0.0010	-0.0004	-0.0024	0.052	51.0	0.0085
A792 to WALL (1)	0.0005	-0.0049	0.0031	0.127	45.6	0.0094
A792 to WALL (2)	-0.0027	0.0008	-0.0015	0.069	45.6	0.0045
A792 to WLOR (1)	0.0008	0.0002	-0.0025	0.052	50.5	0.0051
A792 to WLOR (2)	0.0033	0.0018	0.0064	0.147	50.5	0.0087
A793 to SPAR (2)	-0.0001	0.0004	0.0003	0.105	5.1	0.0019
A793 to TEMP18 (2)	-0.0006	-0.0037	-0.0058	0.170	41.0	0.0063
A822 to FLSH (2)	0.0018	-0.0015	-0.0044	0.108	45.9	0.0062
A822 to GLP2 (1)	-0.0009	0.0011	-0.0088	0.230	38.8	0.0055
A822 to LSW2 (1)	0.0029	-0.0083	0.0165	0.538	34.7	0.0208
A822 to ORVL (1)	-0.0030	0.0021	-0.0042	0.161	34.8	0.0097
A824 to BURL (2)	-0.0018	-0.0003	-0.0011	0.048	43.3	0.0031
A824 to DNV2 (2)	-0.0039	0.0028	0.0249	0.781	32.5	0.0098
ALV2 to CHA2 (1)	-0.0011	0.0121	0.0086	0.282	52.8	0.0105
ALV2 to CHA2 (2)	0.0006	-0.0001	-0.0041	0.079	52.8	0.0093
ALV2 to GBND (1)	0.0031	0.0001	-0.0096	0.159	63.0	0.0066
ALV2 to GBND (2)	-0.0014	0.0003	0.0028	0.050	63.0	0.0021
ALV2 to SARN (1)	0.0028	0.0016	-0.0013	0.073	47.2	0.0097
ALV2 to SARN (2)	0.0015	0.0017	0.0009	0.052	47.2	0.0087
ALV2 to SPAR (1)	0.0020	0.0010	-0.0031	0.058	65.2	0.0066
ALV2 to SPAR (2)	-0.0044	0.0013	-0.0001	0.071	65.2	0.0063
ALV2 to STHR (1)	-0.0003	-0.0009	-0.0033	0.130	26.4	0.0026
ALV2 to STHR (2)	-0.0003	-0.0006	0.0016	0.065	26.4	0.0025
ALV2 to WALL (1)	0.0021	0.0010	-0.0054	0.113	52.3	0.0104
ALV2 to WALL (2)	0.0036	-0.0013	-0.0114	0.229	52.3	0.0096
ALV2 to WLOR (1)	-0.0003	-0.0013	-0.0011	0.050	34.5	0.0027
ALV2 to WLOR (2)	0.0044	0.0052	0.0020	0.206	34.5	0.0074
LEAM to AMHG (1)	-0.0036	-0.0066	-0.0083	0.340	32.9	0.0107
LEAM to AMHG (2)	0.0016	0.0013	-0.0063	0.201	32.9	0.0050
AMHG to M053006 (1)	0.0004	-0.0008	0.0004	0.047	20.8	0.0041
AMHG to OHSB (1)	0.0040	0.0026	0.0088	0.216	46.3	0.0174
AMHG to OHSB (2)	0.0015	0.0033	-0.0054	0.141	46.3	0.0187
AMHG to WNR2 (1)	-0.0015	0.0015	-0.0028	0.117	30.3	0.0050
BTFD to 843025 (1)	-0.0013	-0.0021	0.0074	0.173	45.1	0.0069
BTFD to M053004 (2)	0.0070	0.0014	0.0028	0.167	46.2	0.0092
BTFD to SMCO (5)	0.0028	-0.0005	-0.0014	0.088	35.8	0.0096
STFD to BTFD (1)	0.0047	0.0065	-0.0000	0.142	56.3	0.0192
BTFD to TEMP18 (2)	0.0003	0.0063	-0.0098	0.329	35.4	0.0142
BURL to GLP2 (3)	0.0009	-0.0001	0.0010	0.030	46.2	0.0033
BURL to M053004 (1)	-0.0014	0.0019	-0.0006	0.355	6.8	0.0046
BURL to M053004 (2)	0.0018	-0.0036	-0.0063	1.092	6.8	0.0042
CHA2 to LEAM (1)	-0.0003	0.0001	-0.0031	0.061	51.2	0.0141
CHA2 to LEAM (2)	0.0013	0.0048	0.0054	0.144	51.2	0.0138
CHA2 to M053006 (1)	-0.0015	-0.0008	-0.0022	0.044	61.8	0.0042
CHA2 to SARN (1)	0.0076	0.0018	-0.0020	0.121	66.4	0.0066
CHA2 to SARN (2)	-0.0024	0.0002	-0.0010	0.040	66.4	0.0022
CHA2 to WALL (1)	0.0004	-0.0006	0.0010	0.037	31.9	0.0026
CHA2 to WALL (2)	0.0006	0.0002	-0.0001	0.019	31.9	0.0026
CHA2 to WLOR (1)	-0.0004	-0.0108	-0.0146	0.341	53.1	0.0105
CHA2 to WLOR (2)	0.0038	0.0054	0.0055	0.162	53.1	0.0095
CHA2 to WNR2 (1)	-0.0005	-0.0004	0.0040	0.058	69.3	0.0040
CHA2 to WNR2 (2)	0.0029	-0.0006	-0.0056	0.091	69.3	0.0100
FLSH to LSW2 (2)	0.0024	-0.0028	-0.0068	0.115	67.4	0.0090
FLSH to ORVL (1)	0.0005	0.0001	0.0004	0.014	50.9	0.0047
GBND to LSW2 (1)	0.0017	0.0018	0.0139	0.198	71.6	0.0090
GBND to SARN (1)	-0.0034	0.0000	0.0065	0.100	73.7	0.0068
GBND to STHR (1)	-0.0002	0.0007	0.0029	0.069	43.3	0.0032
GBND to STHR (2)	-0.0005	0.0005	-0.0035	0.082	43.3	0.0031

GLP2 to M053004 (1)	-0.0003	0.0024	-0.0012	0.055	49.4	0.0059
GLP2 to LSW2 (1)	0.0035	-0.0004	-0.0003	0.063	56.3	0.0056
GLP2 to ORVL (2)	-0.0011	-0.0009	0.0157	0.370	42.6	0.0126
LEAM to M053006 (1)	-0.0001	0.0021	-0.0002	0.167	12.5	0.0036
LEAM to OHSB (1)	-0.0041	-0.0030	0.0075	0.178	50.7	0.0160
LEAM to WALL (1)	0.0009	-0.0020	0.0026	0.054	63.6	0.0066
LEAM to WALL (2)	-0.0041	0.0002	0.0038	0.087	63.6	0.0062
LEAM to WNR2 (1)	0.0064	-0.0009	-0.0130	0.321	45.1	0.0163
LNDN to 84U149 (1)	0.0021	-0.0003	0.0297	0.632	47.1	0.0158
LNDN to A793 (1)	0.0003	-0.0003	-0.0143	0.536	26.7	0.0114
LNDN to ALV2 (1)	-0.0006	0.0016	-0.0095	0.177	54.6	0.0062
LNDN to GBND (2)	-0.0007	-0.0001	-0.0002	0.013	53.7	0.0046
LNDN to SPAR (1)	-0.0044	-0.0072	-0.0068	0.340	31.9	0.0115
LNDN to SPAR (2)	-0.0044	-0.0073	-0.0068	0.340	31.9	0.0115
LNDN to STFD (2)	0.0003	-0.0004	-0.0004	0.013	47.2	0.0026
LNDN to STHR (1)	0.0005	0.0002	0.0015	0.050	31.5	0.0027
LNDN to TEMP18 (1)	-0.0019	0.0008	0.0027	0.075	45.8	0.0046
LNDN to TEMP18 (2)	0.0060	0.0028	0.0136	0.330	45.8	0.0066
LNDN to WLOR (1)	-0.0022	0.0051	0.0059	0.152	53.2	0.0105
LNDN to WLOR (2)	0.0003	0.0005	-0.0080	0.151	53.2	0.0086
M053006 to OHSB (1)	-0.0058	0.0008	0.0211	0.495	44.1	0.0192
M053006 to WALL (1)	0.0039	0.0017	-0.0123	0.186	69.9	0.0088
M053006 to WNR2 (1)	0.0037	-0.0036	0.0050	0.184	39.0	0.0184
SARN to STHR (1)	-0.0004	0.0008	-0.0028	0.047	63.1	0.0069
SARN to STHR (2)	-0.0022	0.0024	0.0037	0.078	63.1	0.0068
SARN to WALL (1)	-0.0006	0.0002	0.0014	0.037	40.4	0.0029
SARN to WALL (2)	0.0005	0.0007	-0.0005	0.025	40.4	0.0028
SMCO to A824 (3)	-0.0087	-0.0087	0.0040	0.362	35.7	0.0110
SMCO to DNV2 (3)	0.0069	0.0005	-0.0079	0.166	63.2	0.0091
SPAR to SMCO (1)	-0.0005	0.0005	0.0019	0.033	60.9	0.0036
SPAR to SMCO (3)	-0.0056	-0.0009	-0.0030	0.106	60.9	0.0038
SMCO to TEMP18 (2)	0.0137	-0.0077	0.0231	0.899	31.1	0.0245
SPAR to STHR (2)	-0.0009	0.0042	0.0154	0.306	52.4	0.0104
SPAR to TEMP18 (1)	-0.0019	-0.0016	-0.0094	0.230	42.2	0.0060
SPAR to WLOR (1)	-0.0028	-0.0041	0.0042	0.145	44.6	0.0095
SPAR to WLOR (2)	-0.0007	0.0017	0.0009	0.046	44.6	0.0078
STFD to 843025 (1)	-0.0017	-0.0103	0.0102	0.356	41.0	0.0124
STFD to A535 (1)	0.0005	0.0007	0.0006	0.021	47.6	0.0051
STFD to A822 (1)	0.0014	0.0001	-0.0048	0.078	63.4	0.0038
STFD to GLP2 (1)	-0.0018	-0.0006	0.0058	0.108	56.6	0.0200
STFD to LSW2 (1)	-0.0022	-0.0004	0.0017	0.067	41.9	0.0070
STHR to WLOR (1)	-0.0008	0.0003	0.0011	0.032	43.5	0.0031
WALL to WNR2 (2)	0.0009	0.0025	0.0007	0.047	58.2	0.0179

RMS	0.0034	0.0033	0.0076			

\$ - This session is flagged as a 3-sigma outlier

 CHECK POINT RESIDUALS (East, North, Height - Local Level)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
71U080	0.0045	0.0092	-0.0588
71U117	0.0119	0.0034	-0.0297
81U111	-0.0005	-0.0078	-0.0073
843025	0.0044	-0.0046	0.0299
84U149	0.0289	0.0069	0.0176
883066	0.0208	0.0152	-0.0138
A793	-0.0008	0.0099	-0.0275
ALV2	0.0076	0.0017	-0.0152
AMHG	0.0032	0.0074	-0.0647
BTFD	-0.0008	0.0057	-0.0050
BURL	-0.0180	0.0152	0.0201

CHA2	0.0045	0.0002	-0.0200
DNV2	-0.0067	-0.0009	0.0091
FLSH	0.0013	-0.0045	0.0069
GBND	0.0007	0.0018	-0.0018
GLP2	-0.0006	0.0006	0.0149
LEAM	0.0050	0.0041	-0.0354
LSW2	0.0094	-0.0051	0.0010
M053004	0.0003	0.0020	0.0297
M053006	-0.0028	-0.0001	-0.0230
OHSB	0.0005	0.0038	-0.0390
ORVL	-0.0053	-0.0014	0.0044
SARN	0.0007	0.0019	-0.0243
SMCO	-0.0028	0.0020	0.0088
SPAR	0.0006	0.0053	-0.0031
STFD	0.0021	0.0020	0.0181
STHR	-0.0012	0.0003	-0.0102
WALL	0.0092	0.0119	-0.0319
WLOR	0.0059	-0.0001	-0.0115
WNR2	0.0108	0.0021	-0.0616

RMS	0.0088	0.0062	0.0273

 CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE --	-- RN --	-- RH --
	(m)	(m)	(m)
LNDN	0.0000	0.0000	-0.0000

RMS	0.0000	0.0000	0.0000

 OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	ORTHOHGT
71U080	42 14 49.59934	-82 05 58.54482	162.8002	197.2523
71U117	42 08 39.34135	-83 06 50.10579	140.9413	175.2312
81U111	42 43 46.11198	-82 28 37.51046	141.9977	176.4446
843025	43 32 32.82458	-80 31 05.45581	301.9809	337.1769
84U149	43 08 19.64863	-80 42 00.02591	263.5466	298.7130
883066	42 47 05.69430	-80 36 40.80473	195.4063	230.6791
A535	43 27 18.73963	-80 23 19.24401	275.7308	311.0996
A792	42 18 46.73739	-82 04 37.03271	160.9716	195.4311
A793	42 46 34.46827	-81 06 18.30482	199.2045	234.3355
A822	43 50 47.86470	-80 32 23.15893	425.6894	460.6582
A824	42 59 33.92515	-79 58 00.67140	168.9091	204.3459
ALV2	42 49 09.89980	-81 52 09.15287	194.8608	229.4682
AMHG	42 02 12.05175	-82 59 05.23659	159.7463	194.3337
BTFD	43 09 37.42154	-80 19 45.02438	215.7090	251.1642
BURL	43 21 40.23644	-79 47 28.50828	87.9061	123.7621
CHA2	42 24 21.82080	-82 11 08.73411	158.6400	193.1166
DNV2	42 54 46.35577	-79 35 03.43367	152.0591	187.3397
FLSH	44 15 31.37894	-80 30 17.01017	452.8109	487.8443
GBND	43 22 00.57957	-81 39 56.66287	186.9911	221.7765
GLP2	43 32 28.50947	-80 18 21.64612	315.1329	350.5426
LEAM	42 03 21.79107	-82 35 18.98578	160.0466	194.6770
LNDN	42 59 39.08805	-81 14 38.90100	218.5580	253.4977
LSW2	43 44 32.73886	-80 56 46.44815	359.6480	394.4864
M053004	43 17 58.42101	-79 47 36.67807	40.1027	75.9277
M053006	42 01 38.54138	-82 44 03.76743	140.0850	174.7461
OHSB	41 38 11.21615	-82 49 47.18027	148.3130	183.3752

ORVL	43	53	52.49049	-80	06	44.11669	428.2084	463.5544
SARN	42	58	53.51916	-82	24	10.41408	159.0967	193.4583
SMCO	42	50	17.50063	-80	21	02.37810	203.5868	238.9182
SPAR	42	44	01.37602	-81	04	51.83244	206.6349	241.7890
STFD	43	21	56.41435	-80	57	46.36276	332.9181	367.7932
STHR	42	58	41.32039	-81	37	45.57301	209.4398	244.1904
TEMP18	42	58	29.68822	-80	40	57.84905	239.1065	274.3184
WALL	42	37	08.25856	-82	26	49.33842	147.7451	182.1556
WLOR	42	35	17.34196	-81	35	16.93996	185.6415	220.4726
WNR2	42	18	30.71924	-83	01	00.48579	158.6984	192.7529

 OUTPUT STATION COORDINATES (GRID)

STA_ID	- EASTING - (m)	- NORTHING - (m)	- ELLHGT - (m)	ORTHOHGT (m)
71U080	409286.7275	4677798.5382	162.8002	197.2523
71U117	325322.2810	4667956.3306	140.9413	175.2312
81U111	379077.2183	4731831.9850	141.9977	176.4446
843025	538924.9614	4821168.7038	301.9809	337.1769
84U149	524396.8182	4776271.1922	263.5466	298.7130
883066	531789.7656	4737003.6717	195.4063	230.6791
A535	549458.4182	4811548.0823	275.7308	311.0996
A792	411247.1664	4685088.8218	160.9716	195.4311
A793	491403.7063	4735972.6019	199.2045	234.3355
A822	536993.7568	4854941.4262	425.6894	460.6582
A824	584220.3138	4760528.2881	168.9091	204.3459
ALV2	428944.8593	4741127.9848	194.8608	229.4682
AMHG	335715.5649	4655754.6571	159.7463	194.3337
BTFD	554535.6098	4778845.0142	215.7090	251.1642
BURL	597944.4264	4801633.5443	87.9061	123.7621
CHA2	402424.3789	4695543.3127	158.6400	193.1166
DNV2	615556.2010	4752112.1212	152.0591	187.3397
FLSH	539535.2888	4900727.8071	452.8109	487.8443
GBND	446060.5049	4801766.8810	186.9911	221.7765
GLP2	556066.7873	4821156.7488	315.1329	350.5426
LEAM	368549.0990	4657220.6321	160.0466	194.6770
LNDN	480098.7402	4760198.6447	218.5580	253.4977
LSW2	504329.1173	4843266.8784	359.6480	394.4864
M053004	597859.4260	4794788.1099	40.1027	75.9277
M053006	356422.0482	4654270.4745	140.0850	174.7461
OHSB	347600.0432	4611029.9556	148.3130	183.3752
ORVL	571296.2329	4860917.4695	428.2084	463.5544
SARN	385617.4564	4759718.8766	159.0967	193.4583
SMCO	553065.3399	4743051.2969	203.5868	238.9182
SPAR	493364.0995	4731248.2382	206.6349	241.7890
STFD	503007.7042	4801423.8720	332.9181	367.7932
STHR	448686.4370	4758579.9096	209.4398	244.1904
TEMP18	525870.2057	4758077.8035	239.1065	274.3184
WALL	381327.0154	4719517.2740	147.7451	182.1556
WLOR	451750.9725	4715248.8223	185.6415	220.4726
WNR2	333779.2787	4686002.8575	158.6984	192.7529

 OUTPUT VARIANCE/COVARIANCE

STA_ID	SE/SN/SUP (95.00 %) (m)	----- CX matrix (m)----- (not scaled by confidence level) (ECEF, XYZ cartesian)
71U080	0.0125 0.0126	2.6138e-005 -4.5844e-007 2.8842e-005

	0.0134	2.7201e-007	-1.6951e-006	2.7607e-005
71U117	0.0132	2.9447e-005		
	0.0134	-2.0680e-006	3.7659e-005	
	0.0158	1.3326e-006	-5.6097e-006	3.3528e-005
81U111	0.0126	2.6389e-005		
	0.0128	-5.6237e-007	3.0197e-005	
	0.0138	2.8661e-007	-2.2264e-006	2.8656e-005
843025	0.0128	2.7414e-005		
	0.0127	-6.5163e-007	3.0582e-005	
	0.0141	5.5364e-007	-3.1442e-006	2.9393e-005
84U149	0.0127	2.6959e-005		
	0.0127	-6.1004e-007	3.0510e-005	
	0.0141	4.2272e-007	-3.0060e-006	2.9196e-005
883066	0.0132	2.8879e-005		
	0.0130	-3.3293e-007	3.4847e-005	
	0.0154	4.3073e-007	-5.6818e-006	3.2789e-005
A535	0.0127	2.7249e-005		
	0.0127	-8.3513e-007	3.0670e-005	
	0.0141	6.2050e-007	-2.8707e-006	2.9327e-005
A792	0.0125	2.6083e-005		
	0.0126	-4.7982e-007	2.9052e-005	
	0.0135	2.5478e-007	-1.7602e-006	2.7812e-005
A793	0.0125	2.6169e-005		
	0.0126	-1.8162e-007	2.9254e-005	
	0.0136	2.0481e-007	-2.1844e-006	2.8120e-005
A822	0.0129	2.7889e-005		
	0.0127	-7.8547e-007	3.0872e-005	
	0.0140	6.3563e-007	-2.8522e-006	2.8489e-005
A824	0.0136	3.0891e-005		
	0.0128	-7.8442e-007	3.2651e-005	
	0.0148	1.0256e-006	-4.3066e-006	3.0941e-005
ALV2	0.0124	2.5559e-005		
	0.0124	-2.8177e-007	2.7076e-005	
	0.0129	1.4625e-007	-9.3574e-007	2.6491e-005
AMHG	0.0128	2.7628e-005		
	0.0130	-7.7655e-007	3.2916e-005	
	0.0146	5.2902e-007	-3.4383e-006	3.0457e-005
BTFD	0.0129	2.7705e-005		
	0.0129	-4.7891e-007	3.4057e-005	
	0.0152	5.6160e-007	-5.3242e-006	3.2163e-005
BURL	0.0129	2.8115e-005		
	0.0127	-6.8037e-007	3.0904e-005	
	0.0142	6.9204e-007	-3.2212e-006	2.9526e-005
CHA2	0.0125	2.6027e-005		
	0.0126	-4.0091e-007	2.8575e-005	
	0.0133	2.0177e-007	-1.5395e-006	2.7504e-005
DNV2	0.0154	3.9678e-005		
	0.0136	-8.5338e-008	4.2112e-005	
	0.0171	1.1114e-006	-8.6637e-006	3.7629e-005
FLSH	0.0131	2.9085e-005		

	0.0134	-2.8228e-006	3.9727e-005	
	0.0162	1.6725e-006	-6.6219e-006	3.3433e-005
GBND	0.0124	2.5633e-005		
	0.0125	-3.2848e-007	2.7296e-005	
	0.0130	1.8973e-007	-1.0495e-006	2.6634e-005
GLP2	0.0127	2.7097e-005		
	0.0127	-6.7717e-007	2.9921e-005	
	0.0139	5.4629e-007	-2.6009e-006	2.8729e-005
LEAM	0.0127	2.7079e-005		
	0.0128	-5.1120e-007	3.1115e-005	
	0.0140	3.7161e-007	-2.4361e-006	2.8983e-005
LNDN	0.0122	2.5000e-005		
	0.0122	-2.5777e-019	2.5000e-005	
	0.0122	1.4966e-019	-6.5248e-019	2.5000e-005
LSW2	0.0127	2.7490e-005		
	0.0129	-1.5782e-006	3.1885e-005	
	0.0145	1.1033e-006	-3.4881e-006	3.0231e-005
M053004	0.0129	2.8007e-005		
	0.0127	-7.3701e-007	3.1566e-005	
	0.0144	7.0313e-007	-3.7031e-006	3.0135e-005
M053006	0.0128	2.7443e-005		
	0.0128	-5.0041e-007	3.1429e-005	
	0.0141	3.2937e-007	-2.7245e-006	2.9242e-005
OHSB	0.0140	3.2473e-005		
	0.0145	-7.4410e-007	5.5966e-005	
	0.0193	4.1651e-007	-1.2748e-005	4.1092e-005
ORVL	0.0132	2.9814e-005		
	0.0137	-2.9842e-006	4.2054e-005	
	0.0167	1.7359e-006	-7.2461e-006	3.5288e-005
SARN	0.0125	2.6149e-005		
	0.0126	-3.7024e-007	2.8572e-005	
	0.0133	1.9427e-007	-1.4864e-006	2.7436e-005
SMCO	0.0130	2.8064e-005		
	0.0126	-1.6590e-007	2.9408e-005	
	0.0137	4.1128e-007	-2.2711e-006	2.8230e-005
SPAR	0.0125	2.5916e-005		
	0.0125	-1.4604e-007	2.8003e-005	
	0.0132	1.4034e-007	-1.4436e-006	2.7192e-005
STFD	0.0126	2.6573e-005		
	0.0124	-1.4281e-007	2.7080e-005	
	0.0129	1.9070e-007	-1.0384e-006	2.6301e-005
STHR	0.0123	2.5449e-005		
	0.0124	-2.8621e-007	2.6914e-005	
	0.0129	1.4426e-007	-8.6996e-007	2.6376e-005
TEMP18	0.0125	2.6042e-005		
	0.0126	-2.6815e-007	2.9224e-005	
	0.0137	2.9939e-007	-2.5489e-006	2.8582e-005
WALL	0.0125	2.6058e-005		
	0.0126	-4.1759e-007	2.8763e-005	
	0.0134	2.0862e-007	-1.5995e-006	2.7643e-005

WLOR	0.0124	2.5660e-005		
	0.0125	-3.8739e-007	2.7779e-005	
	0.0131	1.7782e-007	-1.2688e-006	2.7046e-005
WNR2	0.0129	2.7958e-005		
	0.0128	-5.3835e-007	3.1470e-005	
	0.0142	4.1856e-007	-2.8981e-006	2.9343e-005

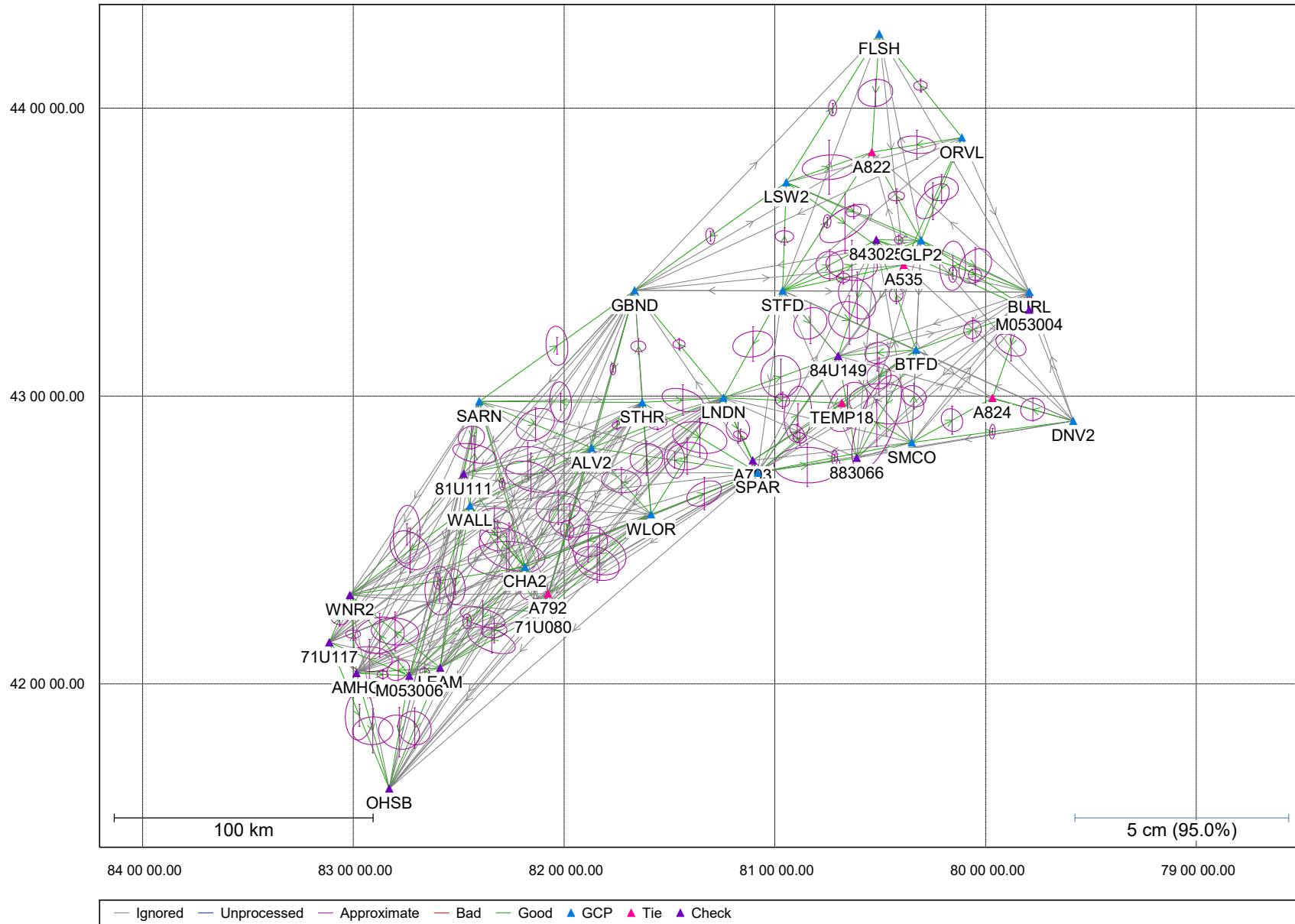
VARIANCE FACTOR = 1.0000

Note: Values < 1.0 indicate statistics are pessimistic, while
values > 1.0 indicate optimistic statistics. Entering this
value as the network adjustment scale factor will bring
variance factor to one.

e.) Fully Constrained Network Adjustment

Network - Map

Geographic, DMS



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*****
* NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT *
* *
* (c) Copyright NovAtel Inc., (2014) *
* *
* Version: 8.50.4320 *
* *
* FILE: P:\1638_OMAFRA_LakeErie_2018\20180102_FieldData\Control Network\Mer
ged\1638_OMAFRA_LakeErie_Merged_Constrained.net
*****

```

DATE(m/d/y): Tue. 1/08/19 TIME: 8:09:19

DATUM: 'NAD83(CSRs)'
 GRID: UTM, Zone 17
 SCALE_FACTOR: 1.8337
 CONFIDENCE LEVEL: 95.00 % (Scale factor is 2.4479)

INPUT CONTROL/CHECK POINTS

STA_ID	TYPE	-- LATITUDE --	-- LONGITUDE --	ELLHGT -	HZ-SD	V-SD
71U080	CHK-3D	42 14 49.59904	-82 05 58.54502	162.859		
71U117	CHK-3D	42 08 39.34124	-83 06 50.10631	140.971		
81U111	CHK-3D	42 43 46.11223	-82 28 37.51044	142.005		
843025	CHK-3D	43 32 32.82473	-80 31 05.45601	301.951		
84U149	CHK-3D	43 08 19.64841	-80 42 00.02719	263.529		
883066	CHK-3D	42 47 05.69381	-80 36 40.80565	195.420		
A793	CHK-3D	42 46 34.46795	-81 06 18.30478	199.232		
ALV2	GCP-3D	42 49 09.89974	-81 52 09.15320	194.876	0.00500	0.00500
AMHG	CHK-3D	42 02 12.05150	-82 59 05.23673	159.811		
BTFD	GCP-3D	43 09 37.42136	-80 19 45.02435	215.714	0.00500	0.00500
BURL	GCP-3D	43 21 40.23595	-79 47 28.50748	87.886	0.00500	0.00500
CHA2	GCP-3D	42 24 21.82079	-82 11 08.73431	158.660	0.00500	0.00500
DNV2	GCP-3D	42 54 46.35580	-79 35 03.43338	152.050	0.00500	0.00500
FLSH	GCP-3D	44 15 31.37909	-80 30 17.01023	452.804	0.00500	0.00500
GBND	GCP-3D	43 22 00.57951	-81 39 56.66290	186.993	0.00500	0.00500
GLP2	GCP-3D	43 32 28.50945	-80 18 21.64609	315.118	0.00500	0.00500
LEAM	CHK-3D	42 03 21.79094	-82 35 18.98600	160.082		
LNDN	GCP-3D	42 59 39.08805	-81 14 38.90100	218.558	0.00500	0.00500
LSW2	GCP-3D	43 44 32.73903	-80 56 46.44857	359.647	0.00500	0.00500
M053004	CHK-3D	43 17 58.42094	-79 47 36.67808	40.073		
M053006	CHK-3D	42 01 38.54138	-82 44 03.76731	140.108		
OHSB	CHK-3D	41 38 11.21603	-82 49 47.18029	148.352		
ORVL	GCP-3D	43 53 52.49053	-80 06 44.11646	428.204	0.00500	0.00500
SARN	GCP-3D	42 58 53.51910	-82 24 10.41411	159.121	0.00500	0.00500
SMCO	GCP-3D	42 50 17.50056	-80 21 02.37798	203.578	0.00500	0.00500
SPAR	GCP-3D	42 44 01.37585	-81 04 51.83246	206.638	0.00500	0.00500
STFD	GCP-3D	43 21 56.41429	-80 57 46.36285	332.900	0.00500	0.00500
STHR	GCP-3D	42 58 41.32038	-81 37 45.57296	209.450	0.00500	0.00500
WALL	GCP-3D	42 37 08.25817	-82 26 49.33882	147.777	0.00500	0.00500
WLOR	GCP-3D	42 35 17.34196	-81 35 16.94022	185.653	0.00500	0.00500
WNR2	CHK-3D	42 18 30.71917	-83 01 00.48626	158.760		

INPUT VECTORS

SESSION NAME	VECTOR(m) DX/DY/DZ	----- Covariance (m) [unscaled] ----- standard deviations in brackets
71U080 to A792 (1)	1172.1771 5134.2079 5412.4588	8.9863e-007 (0.0009) -5.7278e-007 4.7817e-006 (0.0022) 3.3417e-007 -2.3139e-006 3.2261e-006 (0.0018)
71U080 to A792 (3)	1172.1743 5134.2019 5412.4625	8.2957e-007 (0.0009) -4.9624e-007 3.9426e-006 (0.0020) 2.1710e-007 -1.5901e-006 2.6392e-006 (0.0016)
71U080 to LEAM (2)	-38162.0934 -19498.0236 -15735.6296	8.5558e-006 (0.0029) 3.2981e-006 3.5858e-005 (0.0060) 6.2354e-006 -1.5259e-006 3.1419e-005 (0.0056)
71U117 to AMHG (1)	11576.1187 -6672.0850 -8855.1810	2.5011e-006 (0.0016) -2.1910e-006 6.6370e-006 (0.0026) 9.2128e-007 -3.1501e-006 3.9484e-006 (0.0020)
M053006 to 71U117 (1)	-32236.0926 4766.9192 9636.3241	9.6878e-006 (0.0031) -8.2570e-006 6.1645e-005 (0.0079) 6.2943e-006 -2.7222e-005 5.1019e-005 (0.0071)
71U117 to OHSB (1)	28013.9920 -34498.5294 -41983.8736	3.3368e-005 (0.0058) -1.1580e-007 2.4780e-005 (0.0050) -2.1189e-007 -7.1236e-006 1.1884e-005 (0.0034)
71U117 to WNR2 (1)	6480.0792 13128.6118 13523.9974	2.1664e-006 (0.0015) -1.4416e-006 8.3699e-006 (0.0029) 1.5668e-006 -3.3707e-006 6.4861e-006 (0.0025)
81U111 to WNR2 (1)	-40004.9335 -36960.9282 -34453.8356	4.6065e-005 (0.0068) 1.7984e-006 2.2313e-005 (0.0047) -4.1489e-007 -7.4408e-006 1.2704e-005 (0.0036)
843025 to 84U149 (1)	-9529.0522 -32746.6201 -32643.9194	1.9082e-005 (0.0044) 8.7388e-006 1.0666e-004 (0.0103) -1.9242e-006 -6.2640e-005 6.1664e-005 (0.0079)
843025 to M053004 (1)	60960.1797 -8054.6616 -19780.5493	3.2821e-006 (0.0018) -1.0589e-007 2.9186e-006 (0.0017) 4.0744e-007 -1.6021e-006 2.1922e-006 (0.0015)
84U149 to 883066 (2)	11481.3532 -25213.5719 -28816.8455	3.8542e-005 (0.0062) -1.8987e-005 7.0891e-005 (0.0084) 3.8878e-006 -3.6525e-005 4.4960e-005 (0.0067)
A792 to LEAM (1)	-39334.2727 -24632.2261 -21148.0877	3.7166e-006 (0.0019) -5.0180e-006 2.8882e-005 (0.0054) 1.9377e-006 -1.0739e-005 1.1976e-005 (0.0035)
A792 to LEAM (2)	-39334.2687 -24632.2307 -21148.0828	4.2180e-006 (0.0021) -1.7361e-006 1.7153e-005 (0.0041) 2.0924e-006 -6.6560e-006 1.2501e-005 (0.0035)
A793 to TEMP18 (2)	31702.2022 20260.7940 16201.7380	2.1677e-006 (0.0015) 9.0493e-007 1.0600e-005 (0.0033) 5.2661e-007 -4.7184e-006 5.6872e-006 (0.0024)
ALV2 to 71U080 (1)	-12753.2070 -45174.0508 -46869.3727	1.3075e-005 (0.0036) 5.5880e-007 4.4006e-006 (0.0021) 1.3676e-006 -2.1547e-006 2.8231e-006 (0.0017)
ALV2 to 71U080 (2)	-12753.1888 -45174.0429 -46869.3747	5.0240e-006 (0.0022) 5.9058e-007 7.0652e-006 (0.0027) 1.6677e-007 -2.6833e-006 3.6126e-006 (0.0019)

ALV2 to 81U111 (1)	-48366.6698	9.8198e-006	(0.0031)
	-13458.5312	6.8538e-007	6.0449e-005 (0.0078)
	-7370.1114	-4.6744e-006	-1.6781e-005 5.4558e-005 (0.0074)
ALV2 to A792 (1)	-11581.0267	1.9040e-005	(0.0044)
	-40039.8552	-1.3817e-005	6.2799e-005 (0.0079)
	-41456.9091	5.3595e-006	-3.4310e-005 4.3880e-005 (0.0066)
ALV2 to A792 (2)	-11581.0236	1.6790e-005	(0.0041)
	-40039.8475	-8.1534e-006	4.6151e-005 (0.0068)
	-41456.9071	1.0785e-005	-1.9055e-005 3.9580e-005 (0.0063)
LEAM to AMHG (1)	-32360.2689	6.8438e-006	(0.0026)
	-5548.0710	-6.1839e-006	2.3416e-005 (0.0048)
	-1598.1143	3.5826e-006	-1.6705e-005 2.3276e-005 (0.0048)
LEAM to AMHG (2)	-32360.2736	1.0824e-006	(0.0010)
	-5548.0754	-6.1168e-007	6.1608e-006 (0.0025)
	-1598.1215	5.4292e-007	-3.1478e-006 4.3754e-006 (0.0021)
AMHG to M053006 (1)	20659.9782	8.1998e-007	(0.0009)
	1905.1706	-4.0207e-007	3.9195e-006 (0.0020)
	-781.1506	2.0693e-007	-1.7209e-006 2.9009e-006 (0.0017)
AMHG to OHSB (1)	16437.8676	1.0180e-005	(0.0032)
	-27826.4349	-2.5796e-006	7.2432e-005 (0.0085)
	-33128.7106	-2.2393e-007	-4.2287e-005 5.7541e-005 (0.0076)
AMHG to OHSB (2)	16437.8714	7.4071e-006	(0.0027)
	-27826.4456	5.4780e-006	1.1417e-004 (0.0107)
	-33128.7017	-1.7225e-006	-3.5387e-005 4.0439e-005 (0.0064)
AMHG to WNR2 (1)	-5096.0351	1.0755e-006	(0.0010)
	19800.6954	-8.7437e-007	6.2640e-006 (0.0025)
	22379.1736	4.6160e-007	-2.2017e-006 4.3524e-006 (0.0021)
BTFD to 843025 (1)	-19948.0197	2.8709e-006	(0.0017)
	26121.9720	-1.2230e-006	1.0453e-005 (0.0032)
	30925.5435	1.1652e-006	-7.2002e-006 9.1152e-006 (0.0030)
BTFD to 84U149 (2)	-29477.0719	7.2432e-006	(0.0027)
	-6624.6540	-6.8512e-006	4.6543e-005 (0.0068)
	-1718.3654	4.3550e-006	-3.1157e-005 3.2324e-005 (0.0057)
BTFD to 883066 (1)	-17995.7033	4.8746e-005	(0.0070)
	-31838.2058	-4.1360e-005	1.2973e-004 (0.0114)
	-30535.2038	2.3193e-005	-6.3022e-005 5.9066e-005 (0.0077)
BTFD to 883066 (2)	-17995.7225	1.8296e-005	(0.0043)
	-31838.2108	4.5053e-006	1.1526e-004 (0.0107)
	-30535.2192	2.5077e-006	-7.6182e-005 1.8663e-004 (0.0137)
BTFD to M053004 (2)	41012.1491	4.6623e-006	(0.0022)
	18067.2994	-1.6086e-006	1.8610e-005 (0.0043)
	11144.9971	1.0637e-006	-1.3346e-005 1.6287e-005 (0.0040)
BTFD to TEMP18 (2)	-26080.8140	7.9965e-006	(0.0028)
	-18645.8005	-4.4390e-007	4.3837e-005 (0.0066)
	-15038.1410	-2.9693e-008	-3.5193e-005 4.2458e-005 (0.0065)
BURL to 843025 (1)	-60315.0268	3.3607e-005	(0.0058)
	3433.2147	-1.8519e-007	2.0051e-005 (0.0045)
	14768.2769	2.0645e-006	-6.0950e-006 1.0875e-005 (0.0033)
BURL to A824 (2)	-9123.5759	5.3612e-006	(0.0023)
	-30138.3329	8.6358e-007	4.2511e-005 (0.0065)

	-29793.1002	1.9171e-006	-2.0651e-005	2.5822e-005	(0.0051)
BURL to M053004 (1)	645.1499	9.5785e-007	(0.0010)		
	-4621.4482	-6.2898e-007	4.6041e-006	(0.0021)	
	-5012.2748	6.0240e-007	-3.5372e-006	4.2264e-006	(0.0021)
BURL to M053004 (2)	645.1468	1.0228e-006	(0.0010)		
	-4621.4490	-3.9027e-007	3.7998e-006	(0.0019)	
	-5012.2669	3.1433e-007	-2.5139e-006	3.4460e-006	(0.0019)
CHA2 to 71U080 (2)	8661.3488	6.1757e-006	(0.0025)		
	-10809.6640	-3.2985e-006	1.8498e-005	(0.0043)	
	-13051.0416	-6.8061e-007	-4.3098e-006	1.0023e-005	(0.0032)
CHA2 to 81U111 (1)	-26952.1194	8.6719e-006	(0.0029)		
	20905.8648	-3.7155e-006	3.4233e-005	(0.0059)	
	26448.2177	1.6500e-006	-1.3136e-005	3.0927e-005	(0.0056)
CHA2 to A792 (1)	9833.5267	1.5346e-006	(0.0012)		
	-5675.4545	-1.6258e-006	9.2533e-006	(0.0030)	
	-7638.5898	1.1702e-006	-4.8685e-006	5.7160e-006	(0.0024)
CHA2 to A792 (2)	9833.5230	9.3183e-007	(0.0010)		
	-5675.4541	-4.0949e-007	4.4329e-006	(0.0021)	
	-7638.5875	1.5436e-007	-1.9007e-006	3.1416e-006	(0.0018)
CHA2 to ALV2 (1)	21414.5487	1.3369e-005	(0.0037)		
	34364.3902	-1.0989e-005	5.4731e-005	(0.0074)	
	33818.3288	6.7834e-006	-2.4141e-005	3.5733e-005	(0.0060)
CHA2 to ALV2 (2)	21414.5504	1.4090e-005	(0.0038)		
	34364.3815	-6.9090e-006	4.9652e-005	(0.0070)	
	33818.3327	1.9377e-006	-1.7422e-005	3.8626e-005	(0.0062)
CHA2 to LEAM (1)	-29500.7441	5.3386e-006	(0.0023)		
	-30307.6873	1.3838e-008	4.2763e-005	(0.0065)	
	-28786.6708	6.8465e-006	-1.5397e-005	4.4751e-005	(0.0067)
CHA2 to LEAM (2)	-29500.7461	8.9551e-006	(0.0030)		
	-30307.6844	-3.6303e-006	3.9940e-005	(0.0063)	
	-28786.6801	1.0520e-006	-2.6579e-005	3.9337e-005	(0.0063)
CHA2 to M053006 (1)	-41201.0371	3.0541e-006	(0.0017)		
	-33950.5857	2.7215e-007	3.2928e-006	(0.0018)	
	-31165.9464	-4.4010e-008	-1.5719e-006	2.0192e-006	(0.0014)
CHA2 to WNR2 (1)	-66957.0543	3.4730e-006	(0.0019)		
	-16055.0532	4.3023e-008	2.4635e-006	(0.0016)	
	-8005.6271	2.2690e-007	-1.2947e-006	1.5768e-006	(0.0013)
CHA2 to WNR2 (2)	-66957.0567	2.2436e-005	(0.0047)		
	-16055.0605	2.8480e-006	1.6210e-005	(0.0040)	
	-8005.6205	4.9122e-007	-4.5642e-006	7.5521e-006	(0.0027)
DNV2 to A824 (2)	-31794.7771	7.8050e-006	(0.0028)		
	397.1223	-3.8490e-006	1.8179e-005	(0.0043)	
	6506.7169	2.9864e-006	-1.0467e-005	1.8433e-005	(0.0043)
FLSH to A822 (2)	2469.7794	1.0913e-005	(0.0033)		
	-31848.2546	-5.1781e-006	3.8048e-005	(0.0062)	
	-32929.1836	5.1361e-007	-1.2129e-005	1.8836e-005	(0.0043)
GBND to ALV2 (1)	-10445.4062	1.7877e-006	(0.0013)		
	-43498.2498	1.2333e-007	1.5846e-006	(0.0013)	
	-44405.1381	1.0854e-007	-8.0478e-007	9.7615e-007	(0.0010)
GBND to ALV2 (2)	-10445.4034	1.9125e-005	(0.0044)		

	-43498.2398	2.4026e-006	1.4590e-005	(0.0038)
	-44405.1470	6.7297e-007	-3.9871e-006	6.7218e-006 (0.0026)
GLP2 to A535 (2)	-5492.9538	6.3093e-007	(0.0008)	
	-7580.5681	-4.1992e-007	3.0734e-006	(0.0018)
	-6962.2601	2.6853e-007	-1.4702e-006	2.2954e-006 (0.0015)
GLP2 to 843025 (2)	-16925.8392	8.3244e-007	(0.0009)	
	-2756.4032	-4.3096e-007	2.9573e-006	(0.0017)
	87.4796	3.9078e-007	-1.8515e-006	2.7055e-006 (0.0016)
GLP2 to A535 (1)	-5492.9608	1.1948e-006	(0.0011)	
	-7580.5698	-1.0127e-006	4.2776e-006	(0.0021)
	-6962.2614	4.5904e-007	-1.5767e-006	2.6516e-006 (0.0016)
GLP2 to A822 (1)	-22469.4397	1.4856e-006	(0.0012)	
	19898.8602	-1.4987e-006	9.3521e-006	(0.0031)
	24609.9741	5.8596e-007	-3.7710e-006	5.3943e-006 (0.0023)
GLP2 to BURL (3)	43389.1909	2.1962e-005	(0.0047)	
	-6189.6272	-1.8534e-005	4.6774e-005	(0.0068)
	-14680.7944	1.1529e-005	-2.8299e-005	3.7325e-005 (0.0061)
GLP2 to M053004 (1)	44034.3372	2.0747e-006	(0.0014)	
	-10811.0702	-1.1380e-006	7.3098e-006	(0.0027)
	-19693.0702	1.0369e-006	-4.5721e-006	6.6676e-006 (0.0026)
LEAM to M053006 (1)	-11700.2938	6.3896e-007	(0.0008)	
	-3642.9013	-3.2659e-007	3.0422e-006	(0.0017)
	-2379.2771	1.7959e-007	-1.3302e-006	2.2190e-006 (0.0015)
LEAM to OHSB (1)	-15922.3975	1.6504e-005	(0.0041)	
	-33374.5009	-7.5214e-006	6.8302e-005	(0.0083)
	-34726.8303	6.9195e-006	-3.4549e-005	3.4805e-005 (0.0059)
LEAM to WNR2 (1)	-37456.3149	8.0954e-006	(0.0028)	
	14252.6188	4.3704e-006	7.0129e-005	(0.0084)
	20781.0576	-5.1342e-006	-2.6088e-005	4.5271e-005 (0.0067)
LNDN to 84U149 (1)	42057.4092	2.5504e-005	(0.0051)	
	17756.2791	-5.3442e-006	5.1910e-005	(0.0072)
	11767.0426	4.1043e-006	-2.3120e-005	3.8390e-005 (0.0062)
LNDN to A793 (1)	13751.4628	7.4898e-006	(0.0027)	
	-14525.6757	8.0938e-007	2.9800e-005	(0.0055)
	-17754.4357	-3.3896e-007	-1.8497e-005	2.2678e-005 (0.0048)
LNDN to ALV2 (1)	-48555.4744	2.3946e-006	(0.0015)	
	-20553.5694	-1.0561e-006	8.2037e-006	(0.0029)
	-14237.9662	6.3237e-008	-3.0372e-006	7.5617e-006 (0.0027)
LNDN to GBND (2)	-38110.0704	1.1133e-006	(0.0011)	
	22944.6855	-7.0374e-007	5.0242e-006	(0.0022)
	30167.1696	4.3876e-007	-2.3298e-006	3.7038e-006 (0.0019)
LNDN to TEMP18 (1)	45453.6645	1.1638e-006	(0.0011)	
	5735.1318	-4.5155e-007	4.7244e-006	(0.0022)
	-1552.7168	3.2498e-007	-2.9184e-006	4.1653e-006 (0.0020)
LNDN to TEMP18 (2)	45453.6556	2.2437e-006	(0.0015)	
	5735.1372	-3.6890e-007	9.6535e-006	(0.0031)
	-1552.7257	6.9504e-007	-6.1060e-006	8.2060e-006 (0.0029)
LSW2 to FLSH (2)	28538.4064	3.4220e-006	(0.0018)	
	44972.5977	-5.7529e-008	3.4238e-006	(0.0019)
	41332.4635	4.3223e-007	-1.6175e-006	1.6678e-006 (0.0013)

LSW2 to A535 (1)	47984.6549	2.2303e-006	(0.0015)
	-14355.0605	-2.0280e-006	8.8528e-006 (0.0030)
	-23168.9586	1.0260e-006	-4.3147e-006 6.4496e-006 (0.0025)
LSW2 to A535 (2)	47984.6753	3.4461e-005	(0.0059)
	-14355.0944	-5.3393e-005	1.5108e-004 (0.0123)
	-23168.9332	2.0427e-005	-7.2543e-005 5.7825e-005 (0.0076)
LSW2 to A822 (1)	31008.1829	1.5988e-005	(0.0040)
	13124.3607	-1.9852e-005	4.5374e-005 (0.0067)
	8403.2679	1.5220e-005	-2.4665e-005 3.5050e-005 (0.0059)
LSW2 to A822 (2)	31008.1843	1.3765e-005	(0.0037)
	13124.3461	-2.8232e-005	1.5207e-004 (0.0123)
	8403.2845	1.0879e-005	-5.7027e-005 4.0893e-005 (0.0064)
LSW2 to FLSH (1)	28538.4081	3.2601e-006	(0.0018)
	44972.5971	6.8828e-008	4.1803e-006 (0.0020)
	41332.4735	4.7611e-007	-1.8207e-006 1.8282e-006 (0.0014)
LSW2 to GBND (1)	-53144.7501	3.4371e-006	(0.0019)
	-37089.1095	8.6654e-009	4.3981e-006 (0.0021)
	-30363.0143	5.1574e-007	-1.9064e-006 1.8618e-006 (0.0014)
LSW2 to GLP2 (1)	53477.6143	2.1729e-006	(0.0015)
	-6774.4917	-2.0743e-006	8.3254e-006 (0.0029)
	-16206.6984	1.0210e-006	-4.1026e-006 6.0293e-006 (0.0025)
M053006 to OHSB (1)	-4222.1027	1.3630e-005	(0.0037)
	-29731.5933	3.1996e-006	1.1558e-004 (0.0108)
	-32347.5665	-3.9743e-006	-5.2141e-005 4.2344e-005 (0.0065)
M053006 to WNR2 (1)	-25756.0200	1.6647e-005	(0.0041)
	17895.5340	1.2709e-006	9.4209e-005 (0.0097)
	23160.3231	-9.7497e-006	-3.5578e-005 4.6115e-005 (0.0068)
ORVL to A535 (2)	-16236.2532	2.1821e-005	(0.0047)
	-37145.6449	-1.8615e-005	5.4943e-005 (0.0074)
	-35682.0453	4.1127e-006	-2.8760e-005 2.9628e-005 (0.0054)
ORVL to A822 (1)	-33212.7337	4.5067e-006	(0.0021)
	-9666.2077	-4.4802e-006	4.7082e-005 (0.0069)
	-4109.8208	1.7344e-006	-1.2681e-005 1.8781e-005 (0.0043)
ORVL to FLSH (1)	-35682.5136	1.3618e-006	(0.0012)
	22182.0307	-8.5474e-007	5.5721e-006 (0.0024)
	28819.3782	5.0550e-007	-2.9950e-006 5.2309e-006 (0.0023)
ORVL to GLP2 (2)	-10743.3006	8.7157e-006	(0.0030)
	-29565.0711	-5.0648e-006	3.5582e-005 (0.0060)
	-28719.7861	1.9270e-006	-1.4365e-005 2.4148e-005 (0.0049)
SARN to ALV2 (1)	44859.3358	1.8750e-005	(0.0043)
	-6206.7079	-1.8563e-005	5.2676e-005 (0.0073)
	-13168.7617	8.2476e-006	-1.8682e-005 2.4225e-005 (0.0049)
SARN to 81U111 (1)	-3507.3277	8.0080e-006	(0.0028)
	-19665.2435	-5.2536e-006	2.3597e-005 (0.0049)
	-20538.8711	3.1576e-006	-1.0076e-005 1.5660e-005 (0.0040)
SARN to ALV2 (2)	44859.3407	5.7416e-006	(0.0024)
	-6206.7133	-2.9213e-006	4.8165e-005 (0.0069)
	-13168.7556	6.6777e-006	-1.7548e-005 3.7955e-005 (0.0062)
SARN to CHA2 (1)	23444.7973	1.9508e-005	(0.0044)
	-40571.1000	2.0734e-006	1.4657e-005 (0.0038)
	-46987.0810	5.4849e-007	-4.0958e-006 6.8247e-006 (0.0026)

SARN to CHA2 (2)	23444.7866	1.7650e-006	(0.0013)
	-40571.1027	1.0847e-007	1.6039e-006 (0.0013)
	-46987.0825	8.5570e-008	-8.2684e-007 9.8921e-007 (0.0010)
SARN to GBND (1)	55304.7419	2.0366e-005	(0.0045)
	37291.5291	2.4155e-006	1.5613e-005 (0.0040)
	31236.3885	8.3266e-007	-4.2022e-006 7.1388e-006 (0.0027)
SMCO to A824 (3)	28875.8446	7.7030e-006	(0.0028)
	16901.5221	-3.5469e-006	2.5180e-005 (0.0050)
	12551.7267	4.7874e-006	-1.7750e-005 2.3352e-005 (0.0048)
SMCO to BTFD (5)	-2367.5937	6.4335e-006	(0.0025)
	24351.0890	-2.2177e-006	2.2752e-005 (0.0048)
	26187.5512	3.1713e-006	-1.3380e-005 2.1151e-005 (0.0046)
SMCO to DNV2 (2)	60670.6179	2.9836e-006	(0.0017)
	16504.4079	-2.0198e-007	1.5112e-006 (0.0012)
	6044.9929	3.5270e-007	-9.2392e-007 1.1797e-006 (0.0011)
SMCO to TEMP18 (2)	-28448.4287	1.4471e-004	(0.0120)
	5705.3294	-6.1171e-005	7.8972e-005 (0.0089)
	11149.3917	1.5162e-005	-4.0646e-005 5.4698e-005 (0.0074)
SPAR to 84U149 (1)	25865.7984	4.3757e-005	(0.0066)
	35151.2854	-9.3181e-007	2.1511e-005 (0.0046)
	32985.2997	2.7446e-006	-6.3515e-006 1.2278e-005 (0.0035)
SPAR to 883066 (2)	37347.1622	1.8853e-005	(0.0043)
	9937.7268	-7.8454e-006	5.9885e-005 (0.0077)
	4168.4508	4.9624e-006	-2.1083e-005 9.8605e-005 (0.0099)
SPAR to A793 (2)	-2440.1383	4.0303e-007	(0.0006)
	2869.3646	-1.2571e-007	1.7176e-006 (0.0013)
	3463.7918	9.2556e-008	-1.0114e-006 1.3838e-006 (0.0012)
SPAR to ALV2 (1)	-64747.0801	1.7225e-005	(0.0042)
	-3158.5285	1.9506e-006	1.3943e-005 (0.0037)
	6980.2649	6.2205e-007	-3.7633e-006 6.1779e-006 (0.0025)
SPAR to ALV2 (2)	-64747.0747	1.9671e-005	(0.0044)
	-3158.5259	2.5299e-006	1.4904e-005 (0.0039)
	6980.2621	7.2138e-007	-4.0414e-006 6.8176e-006 (0.0026)
SPAR to LNDN (1)	-16191.6023	1.1730e-005	(0.0034)
	17395.0309	-9.0599e-006	3.2983e-005 (0.0057)
	21218.2350	5.2639e-006	-1.8910e-005 3.0149e-005 (0.0055)
SPAR to LNDN (2)	-16191.5991	9.6662e-007	(0.0010)
	17395.0312	-3.9688e-007	5.4473e-006 (0.0023)
	21218.2391	7.2315e-007	-2.4366e-006 4.6975e-006 (0.0022)
SPAR to SMCO (1)	57710.4749	3.1026e-006	(0.0018)
	17424.8539	4.5228e-008	1.6764e-006 (0.0013)
	8516.1174	3.0672e-007	-9.2413e-007 1.1513e-006 (0.0011)
SPAR to SMCO (3)	57710.4804	3.8547e-006	(0.0020)
	17424.8522	1.3464e-007	1.7285e-006 (0.0013)
	8516.1218	2.0313e-007	-9.9031e-007 1.2463e-006 (0.0011)
SPAR to TEMP18 (1)	29262.0657	1.5511e-006	(0.0012)
	23130.1572	-6.3261e-007	7.3009e-006 (0.0027)
	19665.5284	9.4707e-007	-5.2228e-006 8.1723e-006 (0.0029)
STFD to 843025 (1)	33348.1981	1.0850e-005	(0.0033)
	19146.7144	-3.4431e-006	3.1355e-005 (0.0056)

	14237.0566	3.8789e-006	-2.0248e-005	2.9458e-005	(0.0054)
STFD to 84U149 (1)	23819.1438	1.4492e-005	(0.0038)		
	-13599.9265	-7.0115e-006	6.7342e-005	(0.0082)	
	-18406.8577	8.1841e-007	-3.7397e-005	3.7715e-005	(0.0061)
STFD to A535 (1)	44781.0802	1.3531e-006	(0.0012)		
	14322.5362	-7.9791e-007	5.8632e-006	(0.0024)	
	7187.3142	4.9122e-007	-3.0009e-006	5.1156e-006	(0.0023)
STFD to A822 (1)	27804.5995	2.4946e-006	(0.0016)		
	41801.9593	-2.5556e-007	2.6592e-006	(0.0016)	
	38759.5553	3.9164e-007	-1.3064e-006	1.5307e-006	(0.0012)
STFD to BTFD (1)	53296.2147	1.7359e-005	(0.0042)		
	-6975.2703	-2.9929e-006	9.7434e-005	(0.0099)	
	-16688.4956	2.2622e-006	-5.2304e-005	5.7002e-005	(0.0075)
STFD to GLP2 (1)	50274.0394	1.2282e-005	(0.0035)		
	21903.1070	-5.7269e-006	8.9112e-005	(0.0094)	
	14149.5747	5.0300e-006	-5.0918e-005	8.5415e-005	(0.0092)
STFD to GLP2 (2)	50274.0407	1.4895e-006	(0.0012)		
	21903.1052	-9.3518e-007	6.3137e-006	(0.0025)	
	14149.5761	5.4867e-007	-3.2605e-006	5.4754e-006	(0.0023)
STFD to GLP2 (3)	50274.0492	1.9818e-006	(0.0014)		
	21903.1038	-1.3384e-006	9.8996e-006	(0.0031)	
	14149.5817	7.7985e-007	-4.3997e-006	6.3971e-006	(0.0025)
STFD to LNDN (2)	-18238.2584	1.1992e-005	(0.0035)		
	-31356.1987	-1.2587e-005	5.7716e-005	(0.0076)	
	-30173.9050	4.4271e-006	-2.0420e-005	2.7378e-005	(0.0052)
STFD to LSW2 (1)	-3203.5754	2.5317e-006	(0.0016)		
	28677.5986	-2.8484e-006	8.9205e-006	(0.0030)	
	30356.2734	2.7358e-006	-5.6240e-006	1.1522e-005	(0.0034)
STHR to ALV2 (1)	-17669.1711	1.2884e-005	(0.0036)		
	-14680.2610	-7.6547e-006	2.8786e-005	(0.0054)	
	-12927.6717	5.5979e-006	-8.9198e-006	2.0697e-005	(0.0045)
STHR to ALV2 (2)	-17669.1700	7.7147e-007	(0.0009)		
	-14680.2539	-6.1944e-007	3.3141e-006	(0.0018)	
	-12927.6701	3.0511e-007	-1.5187e-006	2.2142e-006	(0.0015)
STHR to GBND (1)	-7223.7639	1.8080e-006	(0.0013)		
	28817.9897	-1.4028e-006	9.2472e-006	(0.0030)	
	31477.4766	1.0005e-006	-4.6359e-006	6.2540e-006	(0.0025)
STHR to GBND (2)	-7223.7674	2.2419e-005	(0.0047)		
	28817.9912	-1.4645e-005	5.8540e-005	(0.0077)	
	31477.4618	1.9559e-005	-2.8097e-005	4.3314e-005	(0.0066)
STHR to LNDN (1)	30886.3057	7.0428e-006	(0.0027)		
	5873.3108	-1.8748e-006	4.8979e-005	(0.0070)	
	1310.3008	4.1047e-006	-1.2873e-005	2.5933e-005	(0.0051)
STHR to SARN (1)	-62528.5111	2.0954e-005	(0.0046)		
	-8473.5439	2.6909e-006	1.5447e-005	(0.0039)	
	241.0937	5.5963e-007	-4.3357e-006	7.1808e-006	(0.0027)
STHR to SARN (2)	-62528.5091	2.0696e-005	(0.0045)		
	-8473.5408	3.7692e-006	1.7257e-005	(0.0042)	
	241.0880	6.0846e-007	-4.3987e-006	7.2721e-006	(0.0027)
STHR to SPAR (2)	47077.9082	1.3676e-005	(0.0037)		

	-11521.7226	-5.5842e-006	8.3522e-005	(0.0091)
	-19907.9334	5.6016e-006	-1.7371e-005	3.6732e-005 (0.0061)
WALL to 71U080 (1)	32079.4502	7.8090e-006	(0.0028)	
	-23784.6812	-9.2226e-006	2.7217e-005	(0.0052)
	-30476.8838	3.7859e-006	-9.3438e-006	1.2322e-005 (0.0035)
WALL to 71U080 (2)	32079.4522	1.4122e-005	(0.0038)	
	-23784.6713	3.3484e-006	1.1500e-004	(0.0107)
	-30476.8873	-1.1538e-005	-3.2810e-005	1.1059e-004 (0.0105)
WALL to 81U111 (1)	-3534.0160	7.9597e-007	(0.0009)	
	7930.8502	-6.1095e-007	3.6433e-006	(0.0019)
	9022.3742	3.1532e-007	-1.6392e-006	2.3239e-006 (0.0015)
WALL to A792 (1)	33251.6300	4.6063e-006	(0.0021)	
	-18650.4718	-2.5025e-006	2.2783e-005	(0.0048)
	-25064.4292	-9.6823e-007	-8.2470e-006	1.2682e-005 (0.0036)
WALL to A792 (2)	33251.6266	3.0647e-005	(0.0055)	
	-18650.4634	-2.5469e-005	1.0440e-004	(0.0102)
	-25064.4318	3.6334e-005	-4.7962e-005	9.2555e-005 (0.0096)
WALL to ALV2 (1)	44832.6512	2.4098e-006	(0.0016)	
	21389.3752	-6.5556e-007	7.5434e-006	(0.0027)
	16392.4851	1.3118e-006	-4.3253e-006	7.8468e-006 (0.0028)
WALL to ALV2 (2)	44832.6520	1.0872e-005	(0.0033)	
	21389.3765	1.7985e-006	1.1042e-004	(0.0105)
	16392.4867	1.9768e-006	-4.1976e-005	4.8292e-005 (0.0069)
WALL to CHA2 (1)	23418.1029	1.8736e-006	(0.0014)	
	-12975.0160	-1.0263e-006	5.5746e-006	(0.0024)
	-17425.8369	8.6343e-007	-2.5915e-006	4.2470e-006 (0.0021)
WALL to CHA2 (2)	23418.1043	1.2892e-005	(0.0036)	
	-12975.0126	-6.4593e-006	4.2481e-005	(0.0065)
	-17425.8426	6.6124e-006	-1.9030e-005	3.0886e-005 (0.0056)
WALL to LEAM (1)	-6082.6466	1.6951e-005	(0.0041)	
	-43282.7032	1.7159e-006	1.3709e-005	(0.0037)
	-46212.5084	6.3643e-007	-3.6588e-006	6.0189e-006 (0.0025)
WALL to LEAM (2)	-6082.6419	1.9194e-005	(0.0044)	
	-43282.7037	2.2632e-006	1.4649e-005	(0.0038)
	-46212.5099	7.6191e-007	-3.9142e-006	6.5797e-006 (0.0026)
WALL to M053006 (1)	-17782.9346	3.1706e-005	(0.0056)	
	-46925.5888	2.0335e-006	2.7877e-005	(0.0053)
	-48591.7943	2.2081e-007	-7.6828e-006	1.2409e-005 (0.0035)
WALL to SARN (1)	-26.6902	1.7614e-005	(0.0042)	
	27596.0931	-1.0794e-005	6.5254e-005	(0.0081)
	29561.2385	1.0280e-005	-2.4122e-005	3.0147e-005 (0.0055)
WALL to SARN (2)	-26.6891	5.2653e-006	(0.0023)	
	27596.0930	-2.1020e-006	4.9615e-005	(0.0070)
	29561.2377	5.7861e-006	-1.9501e-005	4.2510e-005 (0.0065)
WALL to WNR2 (2)	-43538.9529	2.3051e-005	(0.0048)	
	-29030.0728	-1.2312e-005	5.3305e-005	(0.0073)
	-25431.4649	2.1329e-005	-4.1632e-005	7.3160e-005 (0.0086)
WLOR to 71U080 (1)	-38056.5838	5.7101e-005	(0.0076)	
	-31252.1354	-9.3250e-005	2.4547e-004	(0.0157)
	-27983.2910	2.5857e-005	-8.5933e-005	6.4533e-005 (0.0080)

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WJOR to 71U080 (2)  -38056.5740  1.7317e-005 (0.0042)
                   -31252.1394  -7.8837e-006 5.6416e-005 (0.0075)
                   -27983.2830  1.2851e-005 -2.3773e-005 4.7108e-005 (0.0069)

WJOR to A792 (1)   -36884.4101  2.2763e-005 (0.0048)
                   -26117.9336  -1.8825e-005 6.8895e-005 (0.0083)
                   -22570.8345  5.2545e-006 -3.3694e-005 4.2754e-005 (0.0065)

WJOR to A792 (2)   -36884.4059  1.8887e-005 (0.0043)
                   -26117.9295  9.1111e-006 1.5428e-004 (0.0124)
                   -22570.8266  -9.1802e-006 -5.5485e-005 4.4030e-005 (0.0066)

WJOR to ALV2 (1)   -25303.3838  1.9357e-005 (0.0044)
                   13921.9293  -4.0217e-005 1.2989e-004 (0.0114)
                   18886.0732  1.6863e-005 -5.5006e-005 3.6413e-005 (0.0060)

WJOR to ALV2 (2)   -25303.3810  8.2903e-006 (0.0029)
                   13921.9216  -5.3225e-006 3.6774e-005 (0.0061)
                   18886.0793  4.3849e-006 -7.6549e-006 2.1744e-005 (0.0047)

WJOR to CHA2 (1)   -46717.9312  7.9599e-006 (0.0028)
                   -20442.4635  -5.0556e-006 6.2112e-005 (0.0079)
                   -14932.2462  1.1070e-005 -2.6899e-005 5.7013e-005 (0.0076)

WJOR to CHA2 (2)   -46717.9292  1.4815e-005 (0.0038)
                   -20442.4739  -8.2324e-006 8.9165e-005 (0.0094)
                   -14932.2400  4.5059e-006 -3.6752e-005 3.0579e-005 (0.0055)

WJOR to LNDN (1)   23252.0929  1.7284e-005 (0.0042)
                   34475.4866  -2.9305e-005 1.1719e-004 (0.0108)
                   33124.0484  1.1658e-005 -4.2700e-005 3.4743e-005 (0.0059)

WJOR to LNDN (2)   23252.0968  1.2153e-005 (0.0035)
                   34475.4778  -8.4185e-006 4.6487e-005 (0.0068)
                   33124.0608  4.4400e-006 -2.4460e-005 4.5639e-005 (0.0068)

WJOR to SPAR (1)   39443.6941  1.2001e-005 (0.0035)
                   17080.4459  -7.5226e-006 2.7510e-005 (0.0052)
                   11905.8199  1.2337e-006 -6.4183e-006 1.9439e-005 (0.0044)

WJOR to SPAR (2)   39443.6930  1.0359e-005 (0.0032)
                   17080.4467  -6.5587e-006 2.8631e-005 (0.0054)
                   11905.8182  6.0401e-007 -2.1750e-005 4.4440e-005 (0.0067)

WJOR to STHR (1)   -7634.2151  1.3571e-005 (0.0037)
                   28602.1807  -8.0463e-006 4.2671e-005 (0.0065)
                   31813.7501  5.9207e-006 -2.4612e-005 3.5983e-005 (0.0060)

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*****
      OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)
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SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
71U080 to A792 (1)	-0.0020	-0.0011	0.0033	0.534	7.6	0.0040
71U080 to A792 (3)	0.0016	-0.0001	-0.0033	0.489	7.6	0.0037
71U080 to LEAM (2)	-0.0011	0.0027	0.0046	0.119	45.7	0.0118
71U117 to AMHG (1)	-0.0018	0.0020	0.0033	0.266	16.0	0.0049
M053006 to 71U117 (1)	-0.0034	0.0016	0.0041	0.164	34.0	0.0150
71U117 to OHSB (1)	-0.0024	-0.0021	-0.0075	0.133	61.1	0.0113
71U117 to WNR2 (1)	0.0009	-0.0014	-0.0016	0.116	19.9	0.0056
81U111 to WNR2 (1)	-0.0015	0.0036	-0.0067	0.120	64.4	0.0122
843025 to 84U149 (1)	-0.0018	0.0010	0.0130	0.279	47.2	0.0185
843025 to M053004 (1)	-0.0030	-0.0015	0.0013	0.056	64.6	0.0039

84U149 to 883066 (2)	0.0032	0.0080	-0.0046	0.244	40.0	0.0168
A792 to LEAM (1)	0.0024	-0.0005	0.0049	0.108	51.0	0.0090
A792 to LEAM (2)	-0.0010	-0.0007	-0.0021	0.048	51.0	0.0079
A793 to TEMP18 (2)	-0.0000	-0.0024	-0.0061	0.161	41.0	0.0058
ALV2 to 71U080 (1)	0.0073	-0.0003	0.0019	0.113	66.3	0.0061
ALV2 to 71U080 (2)	-0.0118	-0.0023	0.0071	0.211	66.3	0.0054
ALV2 to 81U111 (1)	0.0028	0.0031	-0.0022	0.093	50.7	0.0151
ALV2 to A792 (1)	0.0038	0.0036	-0.0074	0.154	58.8	0.0152
ALV2 to A792 (2)	-0.0004	-0.0028	-0.0035	0.076	58.8	0.0137
LEAM to AMHG (1)	-0.0036	-0.0067	-0.0080	0.337	32.9	0.0099
LEAM to AMHG (2)	0.0016	0.0012	-0.0060	0.193	32.9	0.0046
AMHG to M053006 (1)	0.0004	-0.0008	0.0008	0.060	20.8	0.0037
AMHG to OHSB (1)	0.0040	0.0026	0.0088	0.216	46.3	0.0160
AMHG to OHSB (2)	0.0015	0.0033	-0.0054	0.142	46.3	0.0172
AMHG to WNR2 (1)	-0.0015	0.0014	-0.0031	0.123	30.3	0.0046
BTFD to 843025 (1)	-0.0010	0.0000	-0.0018	0.046	45.1	0.0064
BTFD to 84U149 (2)	-0.0019	-0.0026	-0.0001	0.107	30.3	0.0126
BTFD to 883066 (1)	-0.0171	-0.0116	0.0031	0.439	47.6	0.0209
BTFD to 883066 (2)	0.0026	0.0008	0.0123	0.264	47.6	0.0242
BTFD to M053004 (2)	0.0086	0.0026	-0.0091	0.276	46.2	0.0085
BTFD to TEMP18 (2)	-0.0024	0.0074	-0.0050	0.262	35.4	0.0131
BURL to 843025 (1)	-0.0023	0.0018	0.0011	0.050	62.2	0.0109
BURL to A824 (2)	0.0036	0.0069	0.0054	0.218	43.3	0.0116
BURL to M053004 (1)	-0.0021	0.0026	0.0034	0.689	6.8	0.0042
BURL to M053004 (2)	0.0012	-0.0030	-0.0022	0.569	6.8	0.0039
CHA2 to 71U080 (2)	0.0014	-0.0019	-0.0077	0.422	19.0	0.0080
CHA2 to 81U111 (1)	0.0010	-0.0037	-0.0031	0.114	43.2	0.0116
CHA2 to A792 (1)	-0.0016	0.0012	0.0015	0.182	13.7	0.0055
CHA2 to A792 (2)	0.0020	-0.0012	0.0006	0.172	13.7	0.0039
CHA2 to ALV2 (1)	0.0007	-0.0028	-0.0048	0.106	52.8	0.0138
CHA2 to ALV2 (2)	0.0003	0.0002	-0.0139	0.264	52.8	0.0137
CHA2 to LEAM (1)	-0.0003	0.0003	-0.0031	0.062	51.2	0.0130
CHA2 to LEAM (2)	0.0013	0.0051	0.0054	0.147	51.2	0.0127
CHA2 to M053006 (1)	-0.0015	-0.0007	-0.0015	0.036	61.8	0.0039
CHA2 to WNR2 (1)	-0.0005	-0.0003	0.0040	0.058	69.3	0.0037
CHA2 to WNR2 (2)	0.0028	-0.0005	-0.0056	0.091	69.3	0.0092
DNV2 to A824 (2)	-0.0007	0.0015	0.0021	0.081	32.5	0.0090
FLSH to A822 (2)	-0.0023	0.0080	-0.0186	0.444	45.9	0.0111
GBND to ALV2 (1)	0.0003	-0.0006	-0.0021	0.035	63.0	0.0028
GBND to ALV2 (2)	-0.0039	-0.0006	0.0109	0.184	63.0	0.0086
GLP2 to A535 (2)	-0.0041	-0.0007	0.0002	0.354	11.7	0.0033
GLP2 to 843025 (2)	-0.0005	-0.0008	0.0006	0.063	17.1	0.0035
GLP2 to A535 (1)	0.0031	0.0007	0.0007	0.281	11.7	0.0039
GLP2 to A822 (1)	0.0012	-0.0020	0.0051	0.144	38.8	0.0055
GLP2 to BURL (3)	0.0001	0.0020	-0.0095	0.210	46.2	0.0139
GLP2 to M053004 (1)	0.0007	0.0013	-0.0013	0.041	49.4	0.0054
LEAM to M053006 (1)	-0.0001	0.0019	0.0005	0.160	12.5	0.0033
LEAM to OHSB (1)	-0.0041	-0.0031	0.0077	0.182	50.7	0.0148
LEAM to WNR2 (1)	0.0064	-0.0011	-0.0130	0.322	45.1	0.0150
LNDN to 84U149 (1)	-0.0041	0.0017	0.0175	0.383	47.1	0.0146
LNDN to A793 (1)	-0.0002	-0.0023	-0.0153	0.579	26.7	0.0105
LNDN to ALV2 (1)	-0.0010	0.0004	-0.0060	0.112	54.6	0.0058
LNDN to GBND (2)	0.0001	-0.0010	0.0015	0.034	53.7	0.0042
LNDN to TEMP18 (1)	-0.0019	0.0001	0.0014	0.052	45.8	0.0043
LNDN to TEMP18 (2)	0.0060	0.0021	0.0123	0.302	45.8	0.0061
LSW2 to FLSH (2)	-0.0011	0.0037	0.0030	0.073	67.4	0.0040
LSW2 to A535 (1)	0.0038	-0.0027	0.0022	0.094	55.2	0.0057
LSW2 to A535 (2)	-0.0109	0.0043	-0.0420	0.790	55.2	0.0211
LSW2 to A822 (1)	-0.0035	0.0080	0.0056	0.300	34.7	0.0133
LSW2 to A822 (2)	-0.0025	0.0062	-0.0164	0.510	34.7	0.0195
LSW2 to FLSH (1)	-0.0027	-0.0029	-0.0045	0.089	67.4	0.0041
LSW2 to GBND (1)	-0.0023	-0.0007	0.0001	0.034	71.6	0.0042
LSW2 to GLP2 (1)	0.0022	-0.0019	0.0017	0.059	56.3	0.0055
M053006 to OHSB (1)	-0.0057	0.0008	0.0206	0.485	44.1	0.0177
M053006 to WNR2 (1)	0.0037	-0.0036	0.0043	0.172	39.0	0.0170
ORVL to A535 (2)	-0.0031	0.0053	-0.0146	0.293	54.0	0.0140
ORVL to A822 (1)	-0.0046	0.0056	0.0027	0.223	34.8	0.0114

ORVL to FLSH (1)	0.0008	-0.0025	-0.0009	0.054	50.9	0.0047
ORVL to GLP2 (2)	0.0013	0.0027	-0.0100	0.244	42.6	0.0112
SARN to ALV2 (1)	0.0018	-0.0003	0.0049	0.111	47.2	0.0132
SARN to 81U111 (1)	-0.0011	0.0049	-0.0025	0.196	28.7	0.0093
SARN to ALV2 (2)	-0.0022	-0.0007	-0.0037	0.093	47.2	0.0130
SARN to CHA2 (1)	-0.0087	-0.0022	0.0008	0.136	66.4	0.0087
SARN to CHA2 (2)	0.0023	-0.0003	0.0008	0.037	66.4	0.0028
SARN to GBND (1)	0.0035	0.0002	-0.0105	0.150	73.7	0.0089
SMCO to A824 (3)	-0.0034	-0.0048	-0.0128	0.393	35.7	0.0102
SMCO to BTFD (5)	0.0003	0.0017	-0.0144	0.405	35.8	0.0096
SMCO to DNV2 (2)	-0.0003	0.0002	0.0030	0.047	63.2	0.0032
SMCO to TEMP18 (2)	0.0119	-0.0072	0.0252	0.926	31.1	0.0226
SPAR to 84U149 (1)	0.0113	0.0037	-0.0114	0.301	54.7	0.0119
SPAR to 883066 (2)	0.0020	0.0063	-0.0053	0.219	38.9	0.0180
SPAR to A793 (2)	0.0002	-0.0005	-0.0006	0.153	5.1	0.0025
SPAR to ALV2 (1)	0.0039	-0.0014	0.0072	0.127	65.2	0.0083
SPAR to ALV2 (2)	-0.0018	-0.0005	0.0103	0.160	65.2	0.0087
SPAR to LNDN (1)	0.0031	0.0025	0.0029	0.156	31.9	0.0117
SPAR to LNDN (2)	-0.0001	-0.0004	-0.0000	0.014	31.9	0.0045
SPAR to SMCO (1)	0.0017	0.0008	0.0021	0.046	60.9	0.0033
SPAR to SMCO (3)	-0.0034	-0.0006	-0.0028	0.073	60.9	0.0035
SPAR to TEMP18 (1)	-0.0014	-0.0008	-0.0071	0.173	42.2	0.0056
STFD to 843025 (1)	0.0010	-0.0092	0.0116	0.360	41.0	0.0115
STFD to 84U149 (1)	0.0047	0.0021	0.0065	0.250	33.0	0.0148
STFD to A535 (1)	0.0028	0.0016	0.0039	0.106	47.6	0.0048
STFD to A822 (1)	0.0038	-0.0006	-0.0004	0.061	63.4	0.0035
STFD to BTFD (1)	0.0072	0.0055	0.0106	0.247	56.3	0.0177
STFD to GLP2 (1)	0.0011	0.0008	0.0047	0.086	56.6	0.0185
STFD to GLP2 (2)	0.0001	0.0011	0.0023	0.044	56.6	0.0049
STFD to GLP2 (3)	-0.0080	-0.0010	-0.0035	0.156	56.6	0.0058
STFD to LNDN (2)	0.0007	-0.0001	-0.0038	0.081	47.2	0.0133
STFD to LSW2 (1)	-0.0006	0.0024	0.0029	0.091	41.9	0.0065
STHR to ALV2 (1)	0.0019	0.0058	-0.0012	0.235	26.4	0.0107
STHR to ALV2 (2)	-0.0003	-0.0000	0.0028	0.108	26.4	0.0034
STHR to GBND (1)	0.0005	-0.0014	-0.0055	0.132	43.3	0.0056
STHR to GBND (2)	0.0037	0.0079	0.0061	0.246	43.3	0.0151
STHR to LNDN (1)	0.0002	-0.0006	0.0020	0.068	31.5	0.0123
STHR to SARN (1)	0.0029	-0.0032	-0.0015	0.072	63.1	0.0089
STHR to SARN (2)	0.0004	-0.0009	0.0045	0.072	63.1	0.0091
STHR to SPAR (2)	-0.0027	-0.0019	-0.0032	0.089	52.4	0.0157
WALL to 71U080 (1)	0.0025	0.0024	-0.0077	0.169	50.2	0.0093
WALL to 71U080 (2)	-0.0008	-0.0015	0.0016	0.047	50.2	0.0210
WALL to 81U111 (1)	-0.0002	-0.0000	-0.0007	0.058	12.5	0.0035
WALL to A792 (1)	-0.0024	0.0036	-0.0007	0.096	45.6	0.0086
WALL to A792 (2)	-0.0001	-0.0004	0.0075	0.164	45.6	0.0204
WALL to ALV2 (1)	0.0005	0.0011	-0.0023	0.049	52.3	0.0057
WALL to ALV2 (2)	-0.0005	-0.0008	-0.0025	0.052	52.3	0.0176
WALL to CHA2 (1)	-0.0004	-0.0003	-0.0029	0.094	31.9	0.0046
WALL to CHA2 (2)	-0.0023	0.0017	0.0033	0.137	31.9	0.0126
WALL to LEAM (1)	0.0046	0.0000	-0.0051	0.107	63.6	0.0082
WALL to LEAM (2)	-0.0000	0.0018	-0.0049	0.082	63.6	0.0086
WALL to M053006 (1)	-0.0034	-0.0016	0.0125	0.186	69.9	0.0115
WALL to SARN (1)	0.0028	0.0003	0.0063	0.170	40.4	0.0144
WALL to SARN (2)	0.0018	0.0010	0.0066	0.172	40.4	0.0134
WALL to WNR2 (2)	0.0010	0.0024	-0.0009	0.046	58.2	0.0166
WLOR to 71U080 (1)	0.0032	0.0013	0.0015	0.066	56.6	0.0259
WLOR to 71U080 (2)	-0.0060	-0.0009	-0.0079	0.175	56.6	0.0149
WLOR to A792 (1)	0.0054	0.0056	0.0023	0.161	50.5	0.0157
WLOR to A792 (2)	0.0006	-0.0025	-0.0005	0.052	50.5	0.0200
WLOR to ALV2 (1)	0.0009	-0.0022	0.0162	0.475	34.5	0.0185
WLOR to ALV2 (2)	-0.0008	-0.0012	0.0062	0.184	34.5	0.0111
WLOR to CHA2 (1)	-0.0007	-0.0043	0.0126	0.251	53.1	0.0153
WLOR to CHA2 (2)	-0.0013	-0.0017	0.0007	0.042	53.1	0.0157
WLOR to LNDN (1)	0.0013	-0.0008	0.0071	0.137	53.2	0.0176
WLOR to LNDN (2)	-0.0012	-0.0035	-0.0081	0.168	53.2	0.0138
WLOR to SPAR (1)	0.0008	-0.0016	-0.0072	0.166	44.6	0.0104
WLOR to SPAR (2)	0.0017	-0.0009	-0.0053	0.127	44.6	0.0124

WLOR to STHR (1)	0.0028	-0.0056	0.0072	0.219	43.5	0.0130

RMS	0.0037	0.0032	0.0079			

\$ - This session is flagged as a 3-sigma outlier

 CHECK POINT RESIDUALS (East, North, Height - Local Level)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
71U080	0.0028	0.0071	-0.0438
71U117	0.0102	0.0015	-0.0142
81U111	-0.0034	-0.0090	0.0055
843025	0.0052	-0.0052	0.0237
84U149	0.0205	0.0080	0.0145
883066	0.0153	0.0114	-0.0095
A793	-0.0036	0.0070	-0.0194
AMHG	0.0015	0.0056	-0.0491
LEAM	0.0033	0.0024	-0.0202
M053004	0.0024	0.0005	0.0208
M053006	-0.0046	-0.0019	-0.0071
OHSB	-0.0012	0.0022	-0.0235
WNR2	0.0091	0.0001	-0.0463

RMS	0.0085	0.0059	0.0269

 CONTROL POINT RESIDUALS (ADJUSTMENT MADE)

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
ALV2	0.0050	-0.0003	-0.0026
BTFD	-0.0003	0.0030	-0.0019
BURL	-0.0153	0.0130	0.0072
CHA2	0.0026	-0.0019	-0.0047
DNV2	0.0024	-0.0101	-0.0174
FLSH	0.0019	-0.0068	-0.0039
GBND	-0.0006	-0.0001	0.0090
GLP2	0.0004	0.0002	0.0062
LNDN	-0.0022	-0.0009	0.0091
LSW2	0.0091	-0.0040	-0.0053
ORVL	-0.0055	-0.0027	-0.0047
SARN	-0.0014	-0.0002	-0.0087
SMCO	-0.0033	-0.0000	0.0146
SPAR	-0.0020	0.0029	0.0024
STFD	0.0001	0.0002	0.0105
STHR	-0.0030	-0.0010	0.0030
WALL	0.0073	0.0098	-0.0151
WLOR	0.0044	-0.0009	0.0018

RMS	0.0052	0.0051	0.0085

 OUTPUT STATION COORDINATES (LAT/LONG/HT)

STA_ID	-- LATITUDE --	-- LONGITUDE --	- ELLHGT -	ORTHOHGT
71U080	42 14 49.59927	-82 05 58.54490	162.8152	197.2673

71U117	42	08	39.34129	-83	06	50.10586	140.9568	175.2466
81U111	42	43	46.11194	-82	28	37.51059	142.0105	176.4575
843025	43	32	32.82456	-80	31	05.45578	301.9747	337.1707
84U149	43	08	19.64867	-80	42	00.02628	263.5435	298.7099
883066	42	47	05.69418	-80	36	40.80498	195.4105	230.6834
A535	43	27	18.73960	-80	23	19.24400	275.7265	311.0953
A792	42	18	46.73734	-82	04	37.03279	160.9866	195.4461
A793	42	46	34.46818	-81	06	18.30494	199.2126	234.3436
A822	43	50	47.86462	-80	32	23.15891	425.6862	460.6550
A824	42	59	33.92521	-79	58	00.67119	168.8981	204.3349
ALV2	42	49	09.89973	-81	52	09.15298	194.8735	229.4808
AMHG	42	02	12.05169	-82	59	05.23667	159.7619	194.3492
BTFD	43	09	37.42146	-80	19	45.02436	215.7121	251.1672
BURL	43	21	40.23637	-79	47	28.50816	87.8932	123.7492
CHA2	42	24	21.82073	-82	11	08.73419	158.6553	193.1319
DNV2	42	54	46.35547	-79	35	03.43328	152.0326	187.3132
FLSH	44	15	31.37887	-80	30	17.01015	452.8000	487.8335
GBND	43	22	00.57951	-81	39	56.66293	187.0020	221.7873
GLP2	43	32	28.50946	-80	18	21.64607	315.1242	350.5339
LEAM	42	03	21.79101	-82	35	18.98585	160.0618	194.6923
LNDN	42	59	39.08802	-81	14	38.90110	218.5671	253.5068
LSW2	43	44	32.73890	-80	56	46.44816	359.6417	394.4800
M053004	43	17	58.42096	-79	47	36.67798	40.0938	75.9189
M053006	42	01	38.54132	-82	44	03.76751	140.1009	174.7621
OHSB	41	38	11.21610	-82	49	47.18034	148.3285	183.3907
ORVL	43	53	52.49044	-80	06	44.11670	428.1993	463.5454
SARN	42	58	53.51909	-82	24	10.41417	159.1123	193.4739
SMCO	42	50	17.50056	-80	21	02.37812	203.5926	238.9239
SPAR	42	44	01.37594	-81	04	51.83255	206.6404	241.7946
STFD	43	21	56.41430	-80	57	46.36284	332.9105	367.7856
STHR	42	58	41.32035	-81	37	45.57310	209.4529	244.2035
TEMP18	42	58	29.68817	-80	40	57.84914	239.1144	274.3262
WALL	42	37	08.25849	-82	26	49.33850	147.7619	182.1724
WLOR	42	35	17.34193	-81	35	16.94003	185.6548	220.4858
WNR2	42	18	30.71918	-83	01	00.48586	158.7137	192.7682

 OUTPUT STATION COORDINATES (GRID)

STA_ID	- EASTING - (m)	- NORTHING - (m)	- ELLHGT - (m)	ORTHOHGT (m)
71U080	409286.7257	4677798.5361	162.8152	197.2673
71U117	325322.2793	4667956.3287	140.9568	175.2466
81U111	379077.2153	4731831.9839	142.0105	176.4575
843025	538924.9622	4821168.7032	301.9747	337.1707
84U149	524396.8099	4776271.1933	263.5435	298.7099
883066	531789.7601	4737003.6678	195.4105	230.6834
A535	549458.4186	4811548.0815	275.7265	311.0953
A792	411247.1645	4685088.8203	160.9866	195.4461
A793	491403.7035	4735972.5990	199.2126	234.3436
A822	536993.7573	4854941.4238	425.6862	460.6550
A824	584220.3187	4760528.2901	168.8981	204.3349
ALV2	428944.8568	4741127.9828	194.8735	229.4808
AMHG	335715.5632	4655754.6553	159.7619	194.3492
BTFD	554535.6104	4778845.0115	215.7121	251.1672
BURL	597944.4291	4801633.5421	87.8932	123.7492
CHA2	402424.3770	4695543.3107	158.6553	193.1319
DNV2	615556.2102	4752112.1122	152.0326	187.3132
FLSH	539535.2894	4900727.8049	452.8000	487.8335
GBND	446060.5035	4801766.8791	187.0020	221.7873
GLP2	556066.7882	4821156.7484	315.1242	350.5339
LEAM	368549.0972	4657220.6304	160.0618	194.6923
LNDN	480098.7381	4760198.6438	218.5671	253.5068
LSW2	504329.1170	4843266.8795	359.6417	394.4800

M053004	597859.4280	4794788.1084	40.0938	75.9189
M053006	356422.0464	4654270.4726	140.1009	174.7621
OHSB	347600.0415	4611029.9539	148.3285	183.3907
ORVL	571296.2327	4860917.4681	428.1993	463.5454
SARN	385617.4544	4759718.8745	159.1123	193.4739
SMCO	553065.3395	4743051.2948	203.5926	238.9239
SPAR	493364.0969	4731248.2359	206.6404	241.7946
STFD	503007.7022	4801423.8703	332.9105	367.7856
STHR	448686.4351	4758579.9084	209.4529	244.2035
TEMP18	525870.2035	4758077.8019	239.1144	274.3262
WALL	381327.0134	4719517.2721	147.7619	182.1724
WLOR	451750.9709	4715248.8216	185.6548	220.4858
WNR2	333779.2770	4686002.8555	158.7137	192.7682

OUTPUT VARIANCE/COVARIANCE

STA_ID	SE/SN/SUP (95.00 %)	CX matrix (m)----- (not scaled by confidence level) (m) (ECEF, XYZ cartesian)			
71U080	0.0043	3.1617e-006			
	0.0040	-2.6966e-007	4.7235e-006		
	0.0058	2.5263e-007	-1.3622e-006	3.4633e-006	
71U117	0.0057	5.6648e-006			
	0.0057	-1.5441e-006	1.1549e-005		
	0.0093	1.1357e-006	-4.3290e-006	8.1499e-006	
81U111	0.0046	3.7044e-006			
	0.0051	-7.5438e-007	8.0551e-006		
	0.0076	4.7631e-007	-2.6034e-006	5.8929e-006	
843025	0.0043	3.1088e-006			
	0.0042	-4.4828e-007	5.5901e-006		
	0.0067	4.2339e-007	-2.1895e-006	4.8219e-006	
84U149	0.0064	7.0010e-006			
	0.0061	-1.4836e-006	1.6131e-005		
	0.0112	7.1886e-007	-7.2815e-006	1.0838e-005	
883066	0.0087	1.3579e-005			
	0.0101	-4.8598e-006	3.9961e-005		
	0.0184	2.5424e-006	-1.9202e-005	3.2648e-005	
A535	0.0040	2.8483e-006			
	0.0042	-5.6415e-007	5.3184e-006		
	0.0063	3.5529e-007	-1.7533e-006	4.1886e-006	
A792	0.0042	2.9943e-006			
	0.0041	-3.2932e-007	5.0596e-006		
	0.0060	2.5024e-007	-1.4885e-006	3.7402e-006	
A793	0.0041	2.8257e-006			
	0.0042	-2.2657e-007	5.6242e-006		
	0.0066	2.5708e-007	-2.1244e-006	4.5596e-006	
A822	0.0044	3.3755e-006			
	0.0045	-7.3069e-007	6.6378e-006		
	0.0069	4.8741e-007	-2.1931e-006	4.6286e-006	
A824	0.0062	6.5378e-006			
	0.0065	-1.4108e-006	1.8093e-005		
	0.0127	2.0927e-006	-9.7831e-006	1.5802e-005	

ALV2	0.0036	2.2304e-006		
	0.0034	-9.5486e-008	2.8167e-006	
	0.0043	1.1488e-007	-5.5363e-007	2.2888e-006
AMHG	0.0049	4.1271e-006		
	0.0049	-4.4954e-007	7.5633e-006	
	0.0074	4.5022e-007	-2.5059e-006	5.5698e-006
BTFD	0.0044	3.3151e-006		
	0.0045	-4.3960e-007	6.7052e-006	
	0.0075	3.7544e-007	-2.9337e-006	5.9871e-006
BURL	0.0046	3.6749e-006		
	0.0046	-5.0068e-007	6.5367e-006	
	0.0073	4.8270e-007	-2.5547e-006	5.7003e-006
CHA2	0.0041	2.8004e-006		
	0.0039	-1.4829e-007	3.9124e-006	
	0.0052	1.8233e-007	-8.9068e-007	3.0651e-006
DNV2	0.0058	5.7100e-006		
	0.0042	-2.3680e-007	5.2457e-006	
	0.0064	4.7873e-007	-1.7941e-006	4.4006e-006
FLSH	0.0046	3.6123e-006		
	0.0040	-2.2319e-007	4.8597e-006	
	0.0058	3.3047e-007	-1.4230e-006	3.4283e-006
GBND	0.0037	2.3239e-006		
	0.0034	-1.0376e-007	3.0390e-006	
	0.0045	1.5561e-007	-6.9714e-007	2.3758e-006
GLP2	0.0038	2.5345e-006		
	0.0039	-3.1234e-007	4.0478e-006	
	0.0054	2.3298e-007	-1.1438e-006	3.3558e-006
LEAM	0.0047	3.6855e-006		
	0.0046	-2.5325e-007	6.3507e-006	
	0.0067	3.3694e-007	-1.8435e-006	4.5937e-006
LNDN	0.0036	2.1988e-006		
	0.0038	-2.3669e-007	3.6742e-006	
	0.0052	1.8448e-007	-9.9739e-007	3.1395e-006
LSW2	0.0039	2.6391e-006		
	0.0037	-2.6519e-007	3.6681e-006	
	0.0051	2.6739e-007	-9.6298e-007	2.7826e-006
M053004	0.0044	3.3844e-006		
	0.0044	-4.7354e-007	6.0373e-006	
	0.0070	4.5558e-007	-2.4304e-006	5.2402e-006
M053006	0.0049	3.9839e-006		
	0.0045	-2.1721e-007	6.3729e-006	
	0.0067	2.8192e-007	-1.9484e-006	4.5914e-006
OHSB	0.0071	8.2642e-006		
	0.0077	-4.1943e-007	2.7219e-005	
	0.0138	3.5235e-007	-1.0442e-005	1.4647e-005
ORVL	0.0048	3.9540e-006		
	0.0051	-6.9192e-007	7.4465e-006	
	0.0074	3.4986e-007	-2.3888e-006	6.0045e-006
SARN	0.0044	3.1975e-006		
	0.0040	-8.9457e-008	4.2130e-006	
	0.0053	2.1809e-007	-9.4831e-007	3.1608e-006

SMCO	0.0044	3.2887e-006		
	0.0038	-9.8607e-008	3.7468e-006	
	0.0052	2.3047e-007	-9.7549e-007	3.1696e-006
SPAR	0.0037	2.3439e-006		
	0.0037	-1.3731e-007	3.3009e-006	
	0.0048	1.5396e-007	-7.4015e-007	2.7947e-006
STFD	0.0040	2.7023e-006		
	0.0041	-4.1668e-007	4.5638e-006	
	0.0058	3.0019e-007	-1.3295e-006	3.7389e-006
STHR	0.0038	2.5287e-006		
	0.0040	-3.2395e-007	4.2214e-006	
	0.0054	2.5251e-007	-1.0627e-006	3.2226e-006
TEMP18	0.0040	2.7146e-006		
	0.0042	-3.0960e-007	5.7686e-006	
	0.0069	3.2567e-007	-2.4698e-006	5.0454e-006
WALL	0.0041	2.8796e-006		
	0.0042	-2.2981e-007	4.5791e-006	
	0.0057	2.6902e-007	-1.1574e-006	3.6614e-006
WLOR	0.0042	3.2023e-006		
	0.0048	-9.0769e-007	6.6012e-006	
	0.0069	4.2538e-007	-1.9450e-006	4.8631e-006
WNR2	0.0051	4.3798e-006		
	0.0045	-2.4197e-007	6.2305e-006	
	0.0067	3.5242e-007	-1.9902e-006	4.5507e-006

VARIANCE FACTOR = 1.0246

Note: Values < 1.0 indicate statistics are pessimistic, while
values > 1.0 indicate optimistic statistics. Entering this
value as the network adjustment scale factor will bring
variance factor to one.

f.) NRCan Can-Net Control Station Report



Station Report - CALV

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-ALV2	Ontario	040113	CALV		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 49' 9.899736" ± 0.0008m	W81° 52' 9.153196" ± 0.0004m	194.876 ± 0.0013m
V ϕ (mm/y)	V λ (mm/y)	Vh (mm/y)
-0.93 ± 0.00	1.80 ± 0.00	-1.57 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.608 ± 0.008	229.484	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CAMH

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-AMHG	Ontario	040J02	CAMH		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010

Latitude	Longitude	h (metres)
N42° 02' 12.051504" ± 0.0033m	W82° 59' 5.236732" ± 0.0015m	159.811 ± 0.0052m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
0.03 ± 0.49	1.33 ± 0.22	-5.23 ± 0.77
N (metres)	H (metres)	Published date and project ID
-34.588 ± 0.008	194.399	2018-04-20 M18-007

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CBTF

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-BTFD	Ontario	040P01	CBTF		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 09' 37.421364" ± 0.0004m	W80° 19' 45.024352" ± 0.0002m	215.714 ± 0.0007m
V ϕ (mm/y)	V λ (mm/y)	Vh (mm/y)
-1.24 ± 0.00	1.45 ± 0.00	-1.07 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.456 ± 0.008	251.170	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CBUL

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-BURL	Ontario	030M05	CBUL		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 21' 40.235947" $\pm$ 0.0004m	W79° 47' 28.507483" $\pm$ 0.0002m	87.886 $\pm$ 0.0007m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-1.30 $\pm$ 0.00	1.52 $\pm$ 0.00	-1.13 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-35.856 $\pm$ 0.009	123.742	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CCH2

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-CHA2	Ontario	040J08	CCH2		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 24' 21.82079" ± 0.0006m	W82° 11' 8.734305" ± 0.0003m	158.660 ± 0.0009m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.89 ± 0.00	1.83 ± 0.00	-1.88 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.478 ± 0.008	193.138	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CDN2

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-DNV2	Ontario	030L13	CDN2		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 54' 46.355804" ± 0.0005m	W79° 35' 3.433382" ± 0.0002m	152.050 ± 0.0007m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.23 ± 0.00	1.64 ± 0.00	-1.25 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.282 ± 0.012	187.332	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CFLS

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-FLSH	Ontario	041A07	CFLS		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N44° 15' 31.379089" $\pm$ 0.0005m	W80° 30' 17.01023" $\pm$ 0.0002m	452.804 $\pm$ 0.0007m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-1.51 $\pm$ 0.00	1.56 $\pm$ 0.00	-0.32 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-35.034 $\pm$ 0.012	487.838	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CGBN

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-GBND	Ontario	040P05	CGBN		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 22' 0.579513" ± 0.0005m	W81° 39' 56.662897" ± 0.0002m	186.993 ± 0.0007m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.12 ± 0.00	1.79 ± 0.00	-1.11 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.786 ± 0.009	221.779	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CGLP

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-GLP2	Ontario	040P09	CGLP		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 32' 28.509451" ± 0.0004m	W80° 18' 21.646094" ± 0.0002m	315.118 ± 0.0007m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.38 ± 0.00	1.37 ± 0.00	-0.90 ± 0.00
N (metres)	H (metres)	Published date and project ID
		2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CLEA

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-LEAM	Ontario	040J02	CLEA		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 03' 21.790937" $\pm$ 0.0004m	W82° 35' 18.985995" $\pm$ 0.0002m	160.082 $\pm$ 0.0007m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-0.94 $\pm$ 0.00	1.89 $\pm$ 0.00	-1.85 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-34.631 $\pm$ 0.009	194.713	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CLND

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-LNDN	Ontario	040114	CLND		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 59' 39.088053" ± 0.0004m	W81° 14' 38.901003" ± 0.0002m	218.558 ± 0.0007m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.09 ± 0.00	1.65 ± 0.00	-0.92 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.940 ± 0.011	253.498	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CLS2

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-LSW2	Ontario	040P10	CLS2		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 44' 32.73903" ± 0.0059m	W80° 56' 46.448567" ± 0.0029m	359.647 ± 0.0095m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.15 ± 0.97	0.66 ± 0.47	-4.72 ± 1.56
N (metres)	H (metres)	Published date and project ID
-34.840 ± 0.011	394.487	2017-09-22 M17-008

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CORV

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-ORVL	Ontario	040P16	CORV		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 53' 52.490531" $\pm$ 0.0004m	W80° 06' 44.116457" $\pm$ 0.0002m	428.204 $\pm$ 0.0006m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-1.41 $\pm$ 0.00	1.46 $\pm$ 0.00	-0.72 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-35.347 $\pm$ 0.011	463.551	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CSAR

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-SARN	Ontario	040J16	CSAR		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 58' 53.519099" ± 0.0004m	W82° 24' 10.414114" ± 0.0002m	159.121 ± 0.0007m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.76 ± 0.00	1.88 ± 0.00	-1.95 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.363 ± 0.008	193.484	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CSMC

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-SMCO	Ontario	040116	CSMC		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 50' 17.500558" ± 0.0006m	W80° 21' 2.377982" ± 0.0003m	203.578 ± 0.0009m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.08 ± 0.00	1.56 ± 0.00	-1.23 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.331 ± 0.008	238.909	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CSPA

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-SPAR	Ontario	040111	CSPA		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 44' 1.375853" $\pm$ 0.0004m	W81° 04' 51.832461" $\pm$ 0.0002m	206.638 $\pm$ 0.0007m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-1.02 $\pm$ 0.00	1.67 $\pm$ 0.00	-1.17 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-35.155 $\pm$ 0.011	241.793	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CSTD

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-STFD	Ontario	040P07	CSTD		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N43° 21' 56.414287" ± 0.0007m	W80° 57' 46.362848" ± 0.0004m	332.900 ± 0.0011m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.27 ± 0.00	1.53 ± 0.00	-0.82 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.875 ± 0.011	367.775	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CST3

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-STHR	Ontario	040113	CST3		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 58' 41.320385" $\pm$ 0.0005m	W81° 37' 45.572963" $\pm$ 0.0002m	209.450 $\pm$ 0.0007m
$V\phi$ (mm/y)	$V\lambda$ (mm/y)	Vh (mm/y)
-1.02 $\pm$ 0.00	1.76 $\pm$ 0.00	-1.25 $\pm$ 0.00
N (metres)	H (metres)	Published date and project ID
-34.751 $\pm$ 0.009	244.201	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CWAL

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-WALL	Ontario	040J09	CWAL		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 37' 8.258173" ± 0.0005m	W82° 26' 49.338819" ± 0.0002m	147.777 ± 0.0008m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.76 ± 0.00	1.82 ± 0.00	-2.07 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.411 ± 0.008	182.188	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CWLO

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-WLOR	Ontario	040112	CWLO		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010

Latitude	Longitude	h (metres)
N42° 35' 17.341964" ± 0.0006m	W81° 35' 16.940222" ± 0.0003m	185.653 ± 0.0009m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.99 ± 0.00	1.76 ± 0.00	-1.49 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.832 ± 0.009	220.485	2015-09-24 M15-703

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None



Station Report - CWN2

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
cannet-WNR2	Ontario	040J06	CWN2		CANNET

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010

Latitude	Longitude	h (metres)
N42° 18' 30.719173" ± 0.0068m	W83° 01' 0.486259" ± 0.0031m	158.760 ± 0.0108m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.71 ± 1.09	2.57 ± 0.50	-6.00 ± 1.73
N (metres)	H (metres)	Published date and project ID
-34.056 ± 0.009	192.816	2017-09-29 M17-008

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Unknown		Cansel (cannet)		None

The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.10

1 National Geodetic Survey, Retrieval Date = NOVEMBER 27, 2016

DN5844 *****

DN5844 CORS - This is a GPS Continuously Operating Reference Station.

DN5844 DESIGNATION - SOUTH BASS ISLAND CORS ARP

DN5844 CORS_ID - OHSB

DN5844 PID - DN5844

DN5844 STATE/COUNTY- OH/OTTAWA

DN5844 COUNTRY - US

DN5844 USGS QUAD - PUT-IN-BAY (1969)

DN5844

DN5844 *CURRENT SURVEY CONTROL

DN5844

DN5844* NAD 83(2011) POSITION- 41 38 11.21603(N) 082 49 47.18029(W) ADJUSTED

DN5844* NAD 83(2011) ELLIP HT- 148.352 (meters) (02/??/12) ADJUSTED

DN5844* NAD 83(2011) EPOCH - 2010.00

DN5844* [NAVD 88](#) ORTHO HEIGHT - *(meters) *(feet)

DN5844

DN5844 GEOID HEIGHT - -35.594 (meters) GEOID12B

DN5844 NAD 83(2011) X - 595,883.848 (meters) COMP

DN5844 NAD 83(2011) Y - -4,736,699.235 (meters) COMP

DN5844 NAD 83(2011) Z - 4,215,609.043 (meters) COMP

DN5844

DN5844. Formal positional accuracy estimates are not available for this CORS

DN5844. because its coordinates were determined in part using modeled

DN5844. velocities. Approximate one-sigma accuracies for latitude, longitude,

DN5844. and ellipsoid height can be obtained from the [short-term time series](#).

DN5844. Additional information regarding modeled velocities is available on

DN5844. the [CORS Coordinates](#) and [Multi-Year CORS Solution FAQ](#) web pages.

DN5844

DN5844. The coordinates were established by GPS observations

DN5844. and adjusted by the National Geodetic Survey in February 2012.

DN5844

DN5844. NAD 83(2011) refers to NAD 83 coordinates where the reference frame has

DN5844. been affixed to the stable North American Tectonic Plate.

DN5844

DN5844. The coordinates are valid at the epoch date displayed above

DN5844. which is a decimal equivalence of Year/Month/Day.

DN5844

DN5844. Significant digits in the geoid height do not necessarily reflect accuracy.

DN5844. GEOID12B height accuracy estimate available [here](#).

DN5844

DN5844. The PID for the CORS L1 Phase Center is DN5845.

DN5844

DN5844. The XYZ, and position/ellipsoidal ht. are equivalent.

DN5844

DN5844. The ellipsoidal height was determined by GPS observations

DN5844. and is referenced to NAD 83.

DN5844

DN5844. The following values were computed from the NAD 83(2011) position.

DN5844

DN5844; North East Units Scale Factor Converg.

DN5844; SPC OH N - 218,793.827 572,523.536 MT 0.99998836 -0 12 59.9

DN5844;SPC OH N - 717,826.08 1,878,354.30 sFT 0.99998836 -0 12 59.9
DN5844;UTM 17 - 4,611,029.951 347,600.043 MT 0.99988582 -1 12 57.4
DN5844
DN5844! - Elev Factor x Scale Factor = Combined Factor
DN5844!SPC OH N - 0.99997673 x 0.99998836 = 0.99996509
DN5844!UTM 17 - 0.99997673 x 0.99988582 = 0.99986255

DN5844

DN5844_U.S. NATIONAL GRID SPATIAL ADDRESS: 17TLG4760011029(NAD 83)

DN5844

DN5844 SUPERSEDED SURVEY CONTROL

DN5844

DN5844 NAD 83(CORS)- 41 38 11.21631(N) 082 49 47.18150(W) AD(2002.00) c

DN5844 ELLIP H (02/??/12) 148.332 (m) GP(2002.00) c c

DN5844

DN5844.Superseded values are not recommended for survey control.

DN5844

DN5844.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

DN5844.[See file dsdata.txt](#) to determine how the superseded data were derived.

DN5844

DN5844_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA

DN5844

DN5844 STATION DESCRIPTION

DN5844

DN5844'DESCRIBED BY NATIONAL GEODETIC SURVEY 2012

DN5844'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND

DN5844'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE

DN5844'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.

DN5844' ftp://cors.ngs.noaa.gov/cors/README.txt

DN5844' ftp://cors.ngs.noaa.gov/cors/coord/coord_08

DN5844' ftp://cors.ngs.noaa.gov/cors/station_log

DN5844' http://geodesy.noaa.gov/CORS

*** retrieval complete.

Elapsed Time = 00:00:02

g.) NRCan Passive Control Station Reports



Station Report - 71U080

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
71U080	Ontario	040J01	71U080		42082

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010.0

Latitude	Longitude	h (metres)
N42° 14' 49.599035" ± 0.0053m	W82° 05' 58.545016" ± 0.0038m	162.859 ± 0.0324m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.96 ± 0.00	1.83 ± 0.00	-1.83 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.453 ± 0.009	197.312	2001-01-01 M01707

Vertical Data

Vertical Datum	Elevation (m)	Order	Method	Gravity (mGal)	Published Year
CGVD2013 (2010.0)	197.292	First order	Differential	980302.0 ± 1	2013
CGVD28	197.753	First order	Differential	980302.0 ± 1	1981



Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Permanent agency marker	1988	Geodetic survey division - nrcan	Good	None

Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Cedar Springs

Deep bench mark under access cover in grounds of southwestern regional centre, on northwest side of highway no. 3, 7.2 km southwest of junction with kent county road no. 10, 122 m northeast of centreline of raleigh four rod road, 26.2 m northwest of centre line of highway no. 3, 9.8 m southwest of "southwestern regional centre" sign, 8.5 m west of flag pole, 4.3 m southwest of southwest corner of a flower box.



Station Report - 71U117

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
71U117	Ontario	040J03	71U117		42082SW

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010.0

Latitude	Longitude	h (metres)
N42° 08' 39.341238" ± 0.0010m	W83° 06' 50.106313" ± 0.0010m	140.971 ± 0.0070m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.75 ± 0.00	1.85 ± 0.00	-2.08 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.290 ± 0.009	175.261	2009-01-01 M06707

Vertical Data

Vertical Datum	Elevation (m)	Order	Method	Gravity (mGal)	Published Year
CGVD2013 (2010.0)	175.275	First order	Differential	980295.8 ± 1.1	2013
CGVD28	175.749	First order	Differential	980295.8 ± 1.1	1981



Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Permanent agency marker	2005	Geodetic survey division - nrcan	Good	No inspection text on file

Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Amherstburg

Concrete culvert under highway no. 18, at intersection with essex county road no. 10, 4.9 km north of intersection with richmond street, immediately south of wyandotte indian cemetery, tablet in top of culvert, 30 cm east of west end, 21 cm north of south edge of culvert.



Station Report - 81U111

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
81U111	Ontario	040J09	81U111		42082

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010.0

Latitude	Longitude	h (metres)
N42° 43' 46.112225" ± 0.0010m	W82° 28' 37.510441" ± 0.0010m	142.005 ± 0.0080m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.70 ± 0.00	1.80 ± 0.00	-2.15 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.447 ± 0.008	176.452	2009-01-01 M06707

Vertical Data

Vertical Datum	Elevation (m)	Order	Method	Gravity (mGal)	Published Year
CGVD2013 (2010.0)	176.508	First order	Differential	980342.3 ± 1	2013
CGVD28	176.951	First order	Differential	980342.3 ± 1	1981



Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Permanent agency marker	2005	Geodetic survey division - nrcan	Good	No inspection text on file

Location

Sombra

Deep bench mark under access cover in lambton cundick park along st. Clair parkway (old highway no.40), 1.9 km north of post office, 61.5 m east of centre line of road, 45.0 m south of centre line of sombra road no. 13, 4.7 m southeast of stone wall for "centennial of confederation" plaque, 1.6 m southeast of flag pole.



Station Report - 84U149

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
84U149	Ontario	040P02	84U149		43080

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010.0

Latitude	Longitude	h (metres)
N43° 08' 19.648409" ± 0.0068m	W80° 42' 0.027192" ± 0.0042m	263.529 ± 0.0352m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.21 ± 0.00	1.49 ± 0.00	-0.97 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.166 ± 0.009	298.695	2001-01-01 M01707

Vertical Data

Vertical Datum	Elevation (m)	Order	Method	Gravity (mGal)	Published Year
CGVD2013 (2010.0)	298.664	First order	Differential	980342.2 ± 0.8	2013
CGVD28	299.124	First order	Differential	980342.2 ± 0.8	1985



Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Permanent agency marker	1988	Geodetic survey division - nrcan	Good	None

Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Woodstock

Deep bench mark in manhole in nw quadrant of intersection of hwy #2 and oxford rd #4. Loc approx 43 m n of c/l of westbound lane hwy #2, 46.2 m ne of most w tip of traffic island between westbound lane hwy #2 and ramp, 29.2 m sw of n tip of traffic island between rd #4 and ramp to hwy #2, 15.3 m e of most e part of a dead end turnabout (edge of asphalt), 2.73 m s of maple tree and 2.51 m n of maple tree. An orange cyl witness sign was set 0.20 m away at a mag brg of 35 deg to the sta.



Station Report - 843025

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
PIER 2	Ontario	040P10	843025		GPS

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRs)	2010

Latitude	Longitude	h (metres)
N43° 32' 32.824729" ± 0.0023m	W80° 31' 5.456006" ± 0.0018m	301.951 ± 0.0110m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.42 ± 0.31	1.33 ± 0.23	-0.83 ± 1.45
N (metres)	H (metres)	Published date and project ID
-35.196 ± 0.010	337.147	2013-04-18 M12701

Vertical Data

Vertical Datum	Elevation (m)	Order	Method	Gravity (mGal)	Published Year
CGVD2013 (2010.0)	337.171	First order	Differential	980367.0 ± 1	2013
CGVD28	337.549	First order	Differential	980367.0 ± 1	1999



Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Self centering plate	2015	Geodetic survey division - nrcan	Good	None

Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Conestogo

Conestogo calibration baseline pillar no. 2 (cbn pillar) with steel top plate on northeast side of county road 17 (conestogo road), 0.7 km west of intersection with county road 22, 2.3 km east of junction with county road 85 (formerly highway no. 86), 13.3 m from centre line of road, 9.7 m southeast of power pole, 6.3 m southwest of fence, 4.9 m southwest of power line, at road level. Elevation taken on top at centre of main circular plate anchored on top of pillar.



Station Report - 883066

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
883066	Ontario	040115	883066		GPS

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010.0

Latitude	Longitude	h (metres)
N42° 47' 5.693812" ± 0.0031m	W80° 36' 40.805653" ± 0.0025m	195.420 ± 0.0198m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.03 ± 0.00	1.60 ± 0.00	-1.21 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.274 ± 0.009	230.694	2001-01-01 M01707

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Brass/bronze tablet or cap	1988	Geodetic survey division - nrcan	Good	None



Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Mkr Type D Setting Code 02

From the junc of hwy #3 and hwy #59 e of tillsonburg, drive s on hwy #59 for approx 7.6 km. Mkd by a br tab set in the top of a conc culvert on the e side of hwy #59, 10.98 m e of hwy c/l, 1.83 m w of se end and 0.28 m n of s side. An orange cyl witness sign was set 1.0 m away at a mag brg of 36 deg to the sta.



Station Report - M053004

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
BURLINGTON	Ontario	030M05	M053004		GPS

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010.0

Latitude	Longitude	h (metres)
N43° 17' 58.420945" ± 0.0010m	W79° 47' 36.678083" ± 0.0010m	40.073 ± 0.0060m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-1.29 ± 0.00	1.53 ± 0.00	-1.14 ± 0.00
N (metres)	H (metres)	Published date and project ID
-35.826 ± 0.009	75.899	2009-01-01 M06707

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Brass/bronze tablet or cap	2005	Geodetic survey division - nrcan	Good	None



Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Marked By A Gsd Bronze Tablet Set In Top Of Wharf. Located

Northeast of lift bridge and northwest of gauge near channel wall.



Station Report - M053006

Station 1 of 1

Site Identification

Name	Province	NTS map sheet	Unique Number	Provincial Identifier	Network
KINGSVILLE	Ontario	040J02	M053006		GPS

Station Coordinates

Coordinates	Geoid	Reference Frame	Epoch
geo	CGG2013a	NAD83(CSRS)	2010.0

Latitude	Longitude	h (metres)
N42° 01' 38.54138" ± 0.0010m	W82° 44' 3.767313" ± 0.0010m	140.108 ± 0.0070m
Vφ (mm/y)	Vλ (mm/y)	Vh (mm/y)
-0.93 ± 0.00	1.90 ± 0.00	-1.87 ± 0.00
N (metres)	H (metres)	Published date and project ID
-34.662 ± 0.009	174.770	2009-01-01 M06707

Vertical Data

Use the value of H from the coordinates above.

Station Marker

Marker Type	Inspected in	Established by	Status	Comments
Brass/bronze tablet or cap	2005	Geodetic survey division - nrcan	Good	None



Location

Accessible by passenger car or light truck and a walk of less than 50 m.

Marked By A Gsd Bronze Tablet Set In Top Of Concrete

Retaining wall, northeast of gauge.