

Survey Control Report for:

FRA-070-12.68

PID #77372

Project 4A

Report Submitted by: GPD Group

08.19.2013

Survey Performed by: Doug Nihiser

04.15.2013/04.17.2013

Survey Checked by: Steven L. Mullaney, P.S.

08.19.2013



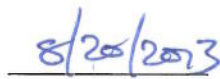
GPD GROUP®
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.

Surveyor's Certification for Primary Project Control

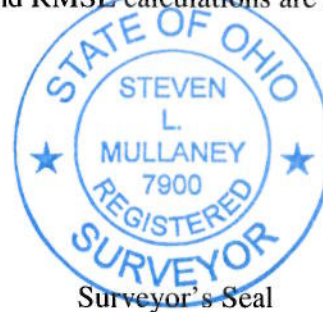
I, Steven L. Mullaney do hereby certify that the Primary Project Control for the FRA-070-12.68 project were constructed and established in accordance with the Ohio Department of Transportation's Survey and Mapping Specifications, dated July 15, 2011 for a major project and meet the accuracy requirements as set forth therein. All aspects of the above referenced specifications were followed except for the datums used and the process to reduce the GPS data. The deviation from the specifications was made in order to re-establish control on the NAD83(86) horizontal datum and the NAVD88 (GEOID 99) vertical datum. This is the original FRA-70-8.93 project datum established by DLZ Ohio, Inc. All observation data and RMSE calculations are on file and available at the request of the Ohio Department of Transportation.



Signature



Date



Surveyor's Seal

Steven L. Mullaney, P.S.

Professional Surveyor No. 7900

Field Crew

Doug Nihiser, PS – Crew Chief

Justin Hinchcliffe, PS – Crew member

Don Quincel – Crew member

Mike Wells – Crew member

Kyle Janes – Crew member

Frank Shay – Crew member

Chuck Goshen – Crew member

Equipment Used

GPS CONTROL SURVEY

GPS Receivers:

Trimble R6 Model 1, s/n 4920172097, purchased August 2010

Trimble R6 Model 2, s/n 5039450636, purchased June 2011

Trimble R6 Model 2, s/n 5045454592, purchased June 2011

Trimble R6 Model 2, s/n 5045454608, purchased June 2011

Trimble R6 Model 2, s/n 5032444403, purchased June 2011

Trimble R6 Model 3, s/n 5239497047, purchased December 2012

Trimble R6 Model 3, s/n 5239497406, purchased December 2012

Trimble R6 Model 3, s/n 5243499562, purchased December 2012

Trimble R6 Model 3, s/n 5226491393, rented from Precision Laser

Trimble R6 Model 3, s/n 5303423282, purchased December 2012

Trimble R6 Model 3, s/n 5243499610, purchased December 2012

Trimble R8 Model 3, s/n 5221488325, rented from Precision Laser

Trimble R8 Model 3, s/n 5225490526, rented from Precision Laser

Trimble R8 Model 3, s/n 5239497431, rented from Precision Laser

Data Collector: Trimble TSC2 w/2.4GHz Radio, s/n SS31C03094

Field Software: Spectra Precision Survey Pro, version 5.0.3

Office Software: Trimble Business Center version 3.0

LEVELING

Digital Level: Trimble Dini, s/n 771448 – Purchased April 2013

Office Software: Trimble Business Center version 3.0

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP206	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPA (1)	4/25/2013	6:54:00 AM	2:37:56 PM	215442.8992	556740.6413	215.5696	0.0008	-0.0021	-0.0026	Y
CPA (2)	4/26/2013	6:42:51 AM	12:15:32 PM	215442.8976	556740.6419	215.5673	-0.0008	-0.0015	-0.0048	Y
CPA (3)	4/26/2013	12:25:55 PM	6:32:22 PM	215442.8983	556740.6546	215.5767	-0.0001	0.0112	0.0046	Y
CPA (4)	4/29/2013	6:17:03 AM	1:08:51 PM	215442.8980	556740.6395	215.5740	-0.0004	-0.0039	0.0018	Y
CPA (5)	4/29/2013	1:10:17 PM	6:20:01 PM	215442.8990	556740.6395	215.5731	0.0006	-0.0039	0.0010	Y

AVERAGE

215442.8984

556740.6434

215.5721

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0006

0.0057

0.0033

RMSE in U.S. Survey Feet:

0.0020

0.0187

0.0108

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	215442.8984	556740.6434	215.5721
US SURVEY FEET (GRID)	706832.2426	1826573.2608	707.2562
US SURVEY FEET (GROUND)*	706832.0277	1826572.6474	707.2562

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED:	
	FRANK143	COC 5-83
MASK ANGLE: 10°		

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP207	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPB (1)	4/25/2013	6:38:11 AM	2:29:40 PM	215452.9106	555995.0663	214.3851	-0.0015	-0.0079	-0.0080	Y
CPB (2)	4/26/2013	6:37:30 AM	12:06:43 PM	215452.9107	555995.0722	214.3813	-0.0014	-0.0019	-0.0119	Y
CPB (3)	4/26/2013	12:08:12 PM	6:26:06 PM	215452.9125	555995.0829	214.3927	0.0004	0.0088	-0.0005	Y
CPB (4)	4/29/2013	6:27:37 AM	1:03:11 PM	215452.9144	555995.0752	214.4135	0.0023	0.0010	0.0204	Y
CPB (5)	4/29/2013	1:05:27 PM	6:11:11 PM	215452.9148	555995.0689	214.3856	0.0027	-0.0053	-0.0075	Y

AVERAGE

215452.9121

555995.0742

214.3931

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0019

0.0058

0.0117

RMSE in U.S. Survey Feet:

0.0061

0.0192

0.0382

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	215452.9121	555995.0742	214.3931
US SURVEY FEET (GRID)	706865.0956	1824127.1724	703.3882
US SURVEY FEET (GROUND)*	706864.8822	1824126.4517	703.3882

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED: FRANK143 COC 5-83
	MASK ANGLE: 10°

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	4/16/2012
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP209	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (GMT)	End Time (GMT)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPC (1)	4/25/2013	6:34:36 AM	2:11:29 PM	215825.6902	555927.7743	218.1750	0.0031	-0.0052	-0.0008	Y
CPC (2)	4/26/2013	6:33:56 AM	12:01:10 PM	215825.6862	555927.7810	218.1720	-0.0009	0.0015	-0.0039	Y
CPC (3)	4/26/2013	12:04:15 PM	6:14:44 PM	215825.6860	555927.7916	218.1809	-0.0011	0.0121	0.0050	Y
CPC (4)	4/29/2013	6:35:37 AM	12:57:40 PM	215825.6864	555927.7750	218.1751	-0.0007	-0.0045	-0.0008	Y
CPC (5)	4/29/2013	1:00:37 PM	6:06:56 PM	215825.6868	555927.7755	218.1763	-0.0003	-0.0040	0.0005	Y

AVERAGE

215825.6871

555927.7795

218.1759

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0016

0.0065

0.0029

RMSE in U.S. Survey Feet:

0.0051

0.0214

0.0095

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	215825.6871	555927.7795	218.1759
US SURVEY FEET (GRID)	708088.1085	1823906.3898	715.7986
US SURVEY FEET (GROUND)*	708087.9488	1823905.6594	715.7986

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED: FRANK143 COC 5-83
	MASK ANGLE: 10°

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP210	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPD (1)	4/25/2013	6:29:23 AM	2:05:13 PM	216390.3331	555765.4091	215.2670	0.0005	-0.0001	-0.0027	Y
CPD (2)	4/26/2013	6:28:55 AM	11:56:07 AM	216390.3322	555765.4077	215.2659	-0.0004	-0.0015	-0.0039	Y
CPD (3)	4/26/2013	11:58:10 AM	6:09:19 PM	216390.3332	555765.4149	215.2748	0.0006	0.0057	0.0051	Y
CPD (4)	4/29/2013	6:50:46 AM	12:52:45 PM	216390.3312	555765.4077	215.2685	-0.0014	-0.0015	-0.0013	Y
CPD (5)	4/29/2013	12:55:10 PM	6:01:08 PM	216390.3334	555765.4067	215.2726	0.0008	-0.0025	0.0028	Y

AVERAGE

216390.3326

555765.4092

215.2698

RMSE:

RMSE:

RMSE:

0.0008

RMSE in Metric:

RMSE in U.S. Survey Feet:

0.0027

0.0029

0.0096

0.0034

0.0111

0.0111

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	216390.3326	555765.4092	215.2698
US SURVEY FEET (GRID)	709940.6163	1823373.6801	706.2643
US SURVEY FEET (GROUND)*	709940.5379	1823372.9263	706.2643

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED:	
	FRANK143	COC 5-83
MASK ANGLE: 10°		

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP215	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPE (1)	4/25/2013	7:01:10 AM	1:54:13 PM	217055.5744	555855.2377	216.4243	0.0002	-0.0016	-0.0018	Y
CPE (2)	4/26/2013	6:49:52 AM	11:41:59 AM	217055.5728	555855.2382	216.4203	-0.0014	-0.0011	-0.0058	Y
CPE (3)	4/26/2013	11:43:30 AM	5:53:13 PM	217055.5745	555855.2467	216.4309	0.0003	0.0074	0.0048	Y
CPE (4)	4/29/2013	7:12:47 AM	12:37:39 PM	217055.5744	555855.2361	216.4274	0.0002	-0.0032	0.0013	Y
CPE (5)	4/29/2013	12:41:03 PM	5:46:58 PM	217055.5747	555855.2378	216.4276	0.0005	-0.0015	0.0015	Y

AVERAGE

217055.5742

555855.2393

216.4261

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0007

0.0038

0.0036

RMSE in U.S. Survey Feet:

0.0023

0.0124

0.0117

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	217055.5742	555855.2393	216.4261
US SURVEY FEET (GRID)	712123.1629	1823668.3976	710.0580
US SURVEY FEET (GROUND)*	712123.1803	1823667.6567	710.0580

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED:	
	FRANK143	COC 5-83
MASK ANGLE: 10°		

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	CP216	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
CPF (1)	4/25/2013	9:24:25 AM	1:45:24 PM	216862.7891	556079.6316	220.0303	0.0017	-0.0010	-0.0039	Y
CPF (2)	4/26/2013	6:57:15 AM	11:46:56 AM	216862.7863	556079.6306	220.0273	-0.0011	-0.0020	-0.0069	Y
CPF (3)	4/26/2013	11:50:03 AM	5:59:19 PM	216862.7875	556079.6396	220.0416	0.0001	0.0070	0.0074	Y
CPF (4)	4/29/2013	7:17:08 AM	12:44:22 PM	216862.7870	556079.6305	220.0345	-0.0004	-0.0021	0.0003	Y
CPF (5)	4/29/2013	12:45:25 PM	5:52:25 PM	216862.7871	556079.6306	220.0373	-0.0003	-0.0020	0.0031	Y

AVERAGE

216862.7874

556079.6326

220.0342

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0009

0.0035

0.0050

RMSE in U.S. Survey Feet:

0.0031

0.0116

0.0166

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	216862.7874	556079.6326	220.0342
US SURVEY FEET (GRID)	711490.6617	1824404.5946	721.8955
US SURVEY FEET (GROUND)*	711490.6513	1824403.8860	721.8955

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: Type A Monument w/Project Control cap set	CONTROL MONUMENTS USED:	
	FRANK143	COC 5-83
MASK ANGLE: 10°		

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	DLZ 070-116	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
070-116 (1)	4/15/2013	7:36:05 AM	3:37:04 PM	217008.7584	558219.9527	233.6195	-0.0004	0.0014	0.0038	Y
070-116 (2)	4/16/2013	5:52:37 AM	11:44:06 AM	217008.7651	558219.9609	233.6100	0.0063	0.0096	-0.0057	Y
070-116 (3)	4/16/2013	11:44:59 AM	4:30:08 PM	217008.7565	558219.9510	233.6107	-0.0023	-0.0003	-0.0051	Y
070-116 (4)	4/17/2013	5:45:46 AM	11:48:37 AM	217008.7593	558219.9481	233.6199	0.0005	-0.0032	0.0042	Y
070-116 (5)	4/17/2013	11:53:11 AM	4:57:15 PM	217008.7635	558219.9473	233.6179	0.0047	-0.0040	0.0021	Y
070-116 (1)	4/25/2013	5:43:31 AM	3:29:17 PM	217008.7538	558219.9503	233.6268	-0.0050	-0.0010	0.0111	Y
070-116 (2)	4/26/2013	5:49:56 AM	1:06:55 PM	217008.7565	558219.9513	233.6162	-0.0023	0.0000	0.0005	Y
070-116 (3)	4/26/2013	1:08:32 PM	5:33:31 PM	217008.7725	558219.9616	233.6320	0.0137	0.0103	0.0162	N
070-116 (4)	4/29/2013	8:08:37 AM	12:13:40 PM	217008.7569	558219.9513	233.6165	-0.0019	0.0000	0.0008	Y
070-116 (5)	4/29/2013	12:16:54 PM	6:30:58 PM	217008.7593	558219.9489	233.6041	0.0005	-0.0024	-0.0117	Y

AVERAGE

217008.7588

558219.9513

233.6157

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0034

0.0038

0.0063

RMSE in U.S. Survey Feet:

0.0110

0.0123

0.0206

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	217008.7588	558219.9513	233.6157
US SURVEY FEET (GRID)	711969.5695	1831426.6236	766.4543
US SURVEY FEET (GROUND)*	711969.5802	1831426.2234	766.4543

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: DLZ Control Point 070-116	CONTROL MONUMENTS USED:
	FRANK143 COC 5-83
MASK ANGLE: 10°	

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Control Monument Coordinate Analysis

PROJECT:	FRA-070-12.68	REPORT DATE:	5/15/2013
PID:	77372	PREPARED BY:	TDM
MONUMENT NUMBER:	071-209	CHECKED BY:	SLM

SESSION #	Observation Date	Start Time (EST)	End Time (EST)	Northing (m)	Easting (m)	Height (m)	Δ Northing (m)	Δ Easting (m)	Δ Height (m)	Included in Solution ? (Y/N)
071-209 (1)	4/15/2013	7:36:05 AM	3:37:04 PM	216585.2101	555925.4453	215.6704	0.0173	0.0053	0.0050	N
071-209 (2)	4/16/2013	5:52:37 AM	11:44:06 AM	216585.2032	555925.4589	215.6406	0.0104	0.0189	-0.0249	N
071-209 (3)	4/16/2013	11:44:59 AM	4:30:08 PM	216585.1950	555925.4483	215.6597	0.0022	0.0083	-0.0058	Y
071-209 (4)	4/17/2013	5:45:46 AM	11:48:37 AM	216585.1952	555925.4469	215.6672	0.0024	0.0069	0.0017	Y
071-209 (5)	4/17/2013	11:53:11 AM	4:57:15 PM	216585.1997	555925.4485	215.6647	0.0069	0.0085	-0.0007	Y
071-209 (1)	4/25/2013	7:17:32 AM	2:50:09 PM	216585.1928	555925.4400	215.6654	-0.0009	-0.0086	-0.0008	Y
071-209 (2)	4/26/2013	8:44:31 AM	12:34:41 PM	216585.1892	555925.4493	215.6615	-0.0045	0.0007	-0.0047	Y
071-209 (3)	4/26/2013	12:36:08 PM	5:47:36 PM	216585.1920	555925.4580	215.6709	-0.0017	0.0094	0.0047	Y
071-209 (4)	4/29/2013	7:34:33 AM	1:19:31 PM	216585.1932	555925.4493	215.6691	-0.0005	0.0007	0.0029	Y
071-209 (5)	4/29/2013	1:20:34 PM	5:42:26 PM	216585.1928	555925.4489	215.6711	-0.0009	0.0003	0.0049	Y

AVERAGE

216585.1937

555925.4486

215.6662

RMSE:

RMSE:

RMSE:

RMSE in Metric:

0.0033

0.0066

0.0038

RMSE in U.S. Survey Feet:

0.0107

0.0218

0.0123

PASS

PASS

PASS

Grid to Ground Multiplier (Scale Factor) 1.000043907

Metric to English Conversion 3.280833333

FINAL MONUMENT COORDINATES			
MONUMENT COORDINATES	Northing	Easting	Ortho Height
METERS (GRID)	216585.1937	555925.4486	215.6662
US SURVEY FEET (GRID)	710579.9232	1823898.7428	707.5648
US SURVEY FEET (GROUND)*	710579.8728	1823898.0120	707.5648

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

Notes: DLZ Control Point 071-209	CONTROL MONUMENTS USED:	
	FRANK143	COC 5-83
MASK ANGLE: 10°		

Δ Northing, Δ Easting, and Δ Height are the differences between the average Northing, Easting, Height, and the values of each individual VRS

Project Information	Coordinate System
Name: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS Elevation.vce	Name: Scale Only
Size: 272 KB	Datum:
Modified: 6/10/2013 4:24:10 PM (UTC:-4)	Zone:
Time zone: Eastern Standard Time	Geoid:
Reference number:	Vertical datum:
Description:	

Level Report

Imported file: [OJECT4.DAT](#)

Instrument: DiNi

Run - 1 Raw Observations

Raw Misclosure: -0.00900 ft
 Σ BS Distances: 12494.170 ft
 Σ FS Distances: 12595.630 ft
Run Length: 25089.800 ft





Closure Check: $0.04 \text{ feet} \times (\sqrt{E})$, E = Length of loop in miles
 $0.04 \times (\sqrt{4.752}) = 0.087 > 0.009$ ✓

Reduction:








Adjusted Values



Create	Point ID	BS	IS	FS	Δ Elevation	Raw Elevation	Correction	Adj. Elevation	Type	Distance	Description
--------	----------	----	----	----	--------------------	---------------	------------	----------------	------	----------	-------------



















	CP4	5.45500 ft			0.00000 ft	714.392 ft	0.00000 ft	714.392 ft	Benchmark	48.200 ft	CP4
	CP219		4.01900 ft	1.43600 ft	715.828 ft	0.00066 ft	715.829 ft	Computed	51.350 ft	CP219	
	CP219	2.48800 ft								178.250 ft	
	1		4.27100 ft	-1.78300 ft	714.045 ft	0.00385 ft	714.049 ft	Computed	304.820 ft		
	1	4.86300 ft								192.390 ft	
	2		3.17800 ft	1.68500 ft	715.730 ft	0.00653 ft	715.737 ft	Computed	214.040 ft		
	2	11.07500 ft								131.820 ft	
	CP3		1.21600 ft	9.85900 ft	725.589 ft	0.00800 ft	725.597 ft	Benchmark	90.220 ft	CP3	
	CP3	10.18800 ft								105.310 ft	
	3		0.76000 ft	9.42800 ft	735.017 ft	0.00801 ft	735.025 ft	Computed	121.520 ft		
	3	12.72200 ft								166.310 ft	
	4		0.22000 ft	12.50200 ft	747.519 ft	0.00802 ft	747.527 ft	Computed	138.350 ft		
	4	11.33000 ft								123.390 ft	
	CP200		0.73400 ft	10.59600 ft	758.115 ft	0.00803 ft	758.123 ft	Computed	150.030 ft	CP200	
	CP200	5.68500 ft								278.480 ft	
	5		6.58500 ft	-0.90000 ft	757.215 ft	0.00806 ft	757.223 ft	Computed	254.820 ft		
	5	3.25500 ft								152.330 ft	
	6		15.59100 ft	-12.33600 ft	744.879 ft	0.00807 ft	744.887 ft	Computed	239.860 ft		
	6	1.61400 ft								61.970 ft	
	7		9.50000 ft	-7.88600 ft	736.993 ft	0.00808 ft	737.001 ft	Computed	157.220 ft		
	7	7.05500 ft								111.420 ft	
	8		1.81700 ft	5.23800 ft	742.231 ft	0.00809 ft	742.239 ft	Computed	80.380 ft		
	8	9.14000 ft								84.120 ft	
	9		1.92000 ft	7.22000 ft	749.451 ft	0.00810 ft	749.459 ft	Computed	140.680 ft		

	9	 5.97400 ft								36.910 ft	
	CP201		 5.03800 ft	0.93600 ft	750.387 ft	0.00810 ft	750.395 ft	Computed	57.020 ft	CP201	
	CP201	 5.40600 ft							223.790 ft		
	10		 6.53600 ft	-1.13000 ft	749.257 ft	0.00813 ft	749.265 ft	Computed	307.150 ft		
	10	 4.42300 ft							229.460 ft		
	11		 5.70000 ft	-1.27700 ft	747.980 ft	0.00814 ft	747.988 ft	Computed	138.620 ft		
	11	 4.14200 ft							160.010 ft		
	CP202		 5.54000 ft	-1.39800 ft	746.582 ft	0.00815 ft	746.590 ft	Computed	147.640 ft	CP202	
	CP202	 5.36900 ft							275.160 ft		
	12		 4.45200 ft	0.91700 ft	747.499 ft	0.00818 ft	747.507 ft	Computed	241.570 ft		
	12	 4.94600 ft							252.530 ft		
	13		 6.69900 ft	-1.75300 ft	745.746 ft	0.00819 ft	745.754 ft	Computed	197.370 ft		
	13	 4.34500 ft							183.100 ft		
	CP203		 3.15600 ft	1.18900 ft	746.935 ft	0.00821 ft	746.943 ft	Computed	129.330 ft	CP203	
	CP203	 7.73200 ft							195.180 ft		
	14		 3.39600 ft	4.33600 ft	751.271 ft	0.00823 ft	751.279 ft	Computed	274.470 ft		
	14	 4.33000 ft							251.110 ft		
	CP204		 7.29500 ft	-2.96500 ft	748.306 ft	0.00825 ft	748.314 ft	Computed	200.290 ft	CP204	
	CP204	 4.58100 ft							225.070 ft		
	15		 6.49300 ft	-1.91200 ft	746.394 ft	0.00826 ft	746.402 ft	Computed	202.950 ft		
	15	 4.17500 ft							183.430 ft		
	CP205		 1.75700 ft	2.41800 ft	748.812 ft	0.00828 ft	748.820 ft	Computed	160.500 ft	CP205	
	CP205	 4.51900 ft							181.270 ft		
	16		 7.52000 ft	-3.00100 ft	745.811 ft	0.00829 ft	745.819 ft	Computed	219.290 ft		











	16	✓ 0.28300 ft								128.180 ft	
	17			✓ 11.79800 ft	-11.51500 ft	734.296 ft	0.00831 ft	734.304 ft	Computed	159.450 ft	
	17	✓ 0.25500 ft								117.220 ft	
	18			✓ 12.99300 ft	-12.73800 ft	721.558 ft	0.00832 ft	721.566 ft	Computed	214.140 ft	
	18	✓ 1.68600 ft								89.530 ft	
	19			✓ 9.15300 ft	-7.46700 ft	714.091 ft	0.00833 ft	714.099 ft	Computed	115.350 ft	
	19	✓ 0.92900 ft								242.090 ft	
	20			✓ 5.95200 ft	-5.02300 ft	709.068 ft	0.00835 ft	709.076 ft	Computed	149.930 ft	
	20	✓ 3.78100 ft								243.700 ft	
	21			✓ 5.36900 ft	-1.58800 ft	707.480 ft	0.00836 ft	707.488 ft	Computed	158.990 ft	
	21	✓ 4.36100 ft								200.430 ft	
✓	CP206			✓ 4.57200 ft	-0.21100 ft	707.269 ft	0.00838 ft	707.277 ft	Computed	136.550 ft	CP206
	CP206	✓ 4.69300 ft								285.530 ft	
	22			✓ 5.69300 ft	-1.00000 ft	706.269 ft	0.00840 ft	706.277 ft	Computed	218.140 ft	
	22	✓ 4.57200 ft								325.790 ft	
	23			✓ 3.25600 ft	1.31600 ft	707.585 ft	0.00842 ft	707.593 ft	Computed	280.310 ft	
	23	✓ 2.99300 ft								200.430 ft	
	24			✓ 6.19500 ft	-3.20200 ft	704.383 ft	0.00844 ft	704.391 ft	Computed	202.360 ft	
	24	✓ 5.86200 ft								295.960 ft	
	25			✓ 6.17800 ft	-0.31600 ft	704.067 ft	0.00846 ft	704.075 ft	Computed	197.210 ft	
	25	✓ 3.90100 ft								198.620 ft	
✓	CP207			✓ 4.61700 ft	-0.71600 ft	703.351 ft	0.00848 ft	703.359 ft	Computed	249.640 ft	CP207
	CP207	✓ 7.23100 ft								197.470 ft	
✓	CP208			✓ 2.50800 ft	4.72300 ft	708.074 ft	0.00850 ft	708.082 ft	Computed	229.720 ft	CP208













	CP208	 8.28900 ft								166.210 ft	
	26			 2.15900 ft	6.13000 ft	714.204 ft	0.00851 ft	714.213 ft	Computed	181.530 ft	
	26	 7.13400 ft								231.400 ft	
	CP209			 5.53300 ft	1.60100 ft	715.805 ft	0.00853 ft	715.814 ft	Computed	238.580 ft	CP209
	CP209	 3.79100 ft								253.540 ft	
	27			 5.27200 ft	-1.48100 ft	714.324 ft	0.00855 ft	714.333 ft	Computed	250.490 ft	
	27	 2.98400 ft								283.230 ft	
	28			 7.71100 ft	-4.72700 ft	709.597 ft	0.00858 ft	709.606 ft	Computed	282.090 ft	
	28	 3.12800 ft								249.700 ft	
	29			 5.66600 ft	-2.53800 ft	707.059 ft	0.00860 ft	707.068 ft	Computed	241.800 ft	
	29	 4.48800 ft								204.300 ft	
	CP210			 5.26900 ft	-0.78100 ft	706.278 ft	0.00861 ft	706.287 ft	Computed	167.190 ft	CP210
	CP210	 4.07400 ft								283.000 ft	
	CP211			 3.35200 ft	0.72200 ft	707.000 ft	0.00864 ft	707.009 ft	Computed	281.950 ft	CP211
	CP211	 3.38500 ft								247.600 ft	
	30			 3.72200 ft	-0.33700 ft	706.663 ft	0.00866 ft	706.672 ft	Computed	257.250 ft	
	30	 5.11700 ft								129.070 ft	
	CP212			 6.25900 ft	-1.14200 ft	705.521 ft	0.00867 ft	705.530 ft	Computed	152.660 ft	CP212
	CP212	 4.55700 ft								267.850 ft	
	31			 5.28700 ft	-0.73000 ft	704.791 ft	0.00869 ft	704.800 ft	Computed	268.830 ft	
	31	 4.95100 ft								250.720 ft	
	32			 4.20400 ft	0.74700 ft	705.538 ft	0.00871 ft	705.547 ft	Computed	249.510 ft	
	32	 6.00700 ft								172.440 ft	
	CP213			 3.90000 ft	2.10700 ft	707.645 ft	0.00873 ft	707.654 ft	Computed	207.580 ft	CP213

	CP213	✓ 4.04300 ft								166.670 ft	
	33			✓ 6.52000 ft	-2.47700 ft	705.168 ft	0.00874 ft	705.177 ft	Computed	163.020 ft	
	33	✓ 6.05100 ft								183.140 ft	
✓	CP214			✓ 4.61800 ft	1.43300 ft	706.601 ft	0.00875 ft	706.610 ft	Computed	98.650 ft	CP214
	CP214	✓ 6.44900 ft								200.330 ft	
	34			✓ 7.11500 ft	-0.66600 ft	705.935 ft	0.00877 ft	705.944 ft	Computed	187.860 ft	
	34	✓ 7.04600 ft								169.060 ft	
✓	CP215			✓ 2.91900 ft	4.12700 ft	710.062 ft	0.00879 ft	710.071 ft	Computed	291.440 ft	CP215
	CP215	✓ 4.24200 ft								256.040 ft	
	35			✓ 6.01800 ft	-1.77600 ft	708.286 ft	0.00881 ft	708.295 ft	Computed	276.710 ft	
	35	✓ 6.81400 ft								169.590 ft	
	36			✓ 0.56800 ft	6.24600 ft	714.532 ft	0.00882 ft	714.541 ft	Computed	137.830 ft	
	36	✓ 10.70800 ft								58.600 ft	
✓	CP216			✓ 3.34200 ft	7.36600 ft	721.898 ft	0.00883 ft	721.907 ft	Computed	164.800 ft	CP216
	CP216	✓ 4.95800 ft								234.710 ft	
	37			✓ 4.66700 ft	0.29100 ft	722.189 ft	0.00885 ft	722.198 ft	Computed	217.810 ft	
	37	✓ 3.62100 ft								280.180 ft	
	38			✓ 2.80500 ft	0.81600 ft	723.005 ft	0.00888 ft	723.014 ft	Computed	298.560 ft	
	38	✓ 3.34000 ft								33.070 ft	
✓	CP217			✓ 7.28200 ft	-3.94200 ft	719.063 ft	0.00888 ft	719.072 ft	Computed	17.550 ft	CP217
	CP217	✓ 8.33300 ft								144.780 ft	
	39			✓ 4.25200 ft	4.08100 ft	723.144 ft	0.00889 ft	723.153 ft	Computed	143.570 ft	
	39	✓ 4.87100 ft								174.410 ft	
✓	CP218			✓ 4.83200 ft	0.03900 ft	723.183 ft	0.00890 ft	723.192 ft	Computed	141.240 ft	CP218



	CP218	 4.44900 ft								186.810 ft	
	40			 7.17200 ft	-2.72300 ft	720.460 ft	0.00892 ft	720.469 ft	Computed	266.860 ft	
	40	 8.23300 ft								238.320 ft	
	41			 0.40500 ft	7.82800 ft	728.288 ft	0.00894 ft	728.297 ft	Computed	173.520 ft	
	41	 8.44600 ft								254.720 ft	
	42			 12.78400 ft	-4.33800 ft	723.950 ft	0.00896 ft	723.959 ft	Computed	309.050 ft	
	42	 2.56800 ft								115.190 ft	
	43			 7.09700 ft	-4.52900 ft	719.421 ft	0.00897 ft	719.430 ft	Computed	104.330 ft	
	43	 5.92100 ft								221.880 ft	
	44			 7.49500 ft	-1.57400 ft	717.847 ft	0.00899 ft	717.856 ft	Computed	200.130 ft	
	44	 8.66400 ft								111.650 ft	
	CP3			 0.92300 ft	7.74100 ft	725.588 ft	0.00900 ft	725.597 ft 	Benchmark	91.960 ft	CP3

Run - 1 (N2) Reduced Observations

Observation	Status	Raw Δ Elevation	Correction	Final Δ Elevation	Setups	Length	Σ BS Readings	Σ FS Readings	Std. Error
 CP4-CP219 (E10)	Enabled	1.43600 ft	0.00066 ft	1.43666 ft	1	99.550 ft	5.45500 ft	4.01900 ft	0.00040 ft
 CP219-CP3 (E11)	Enabled	9.76100 ft	0.00734 ft	9.76834 ft	3	1111.540 ft	18.42600 ft	8.66500 ft	0.00134 ft
 CP3-CP200 (E12)	Enabled	32.52600 ft	0.00003 ft	32.52603 ft	3	804.910 ft	34.24000 ft	1.71400 ft	0.00114 ft
 CP200-CP201 (E13)	Enabled	-7.72800 ft	0.00007 ft	-7.72793 ft	6	1655.210 ft	32.72300 ft	40.45100 ft	0.00163 ft
 CP201-CP202 (E14)	Enabled	-3.80500 ft	0.00005 ft	-3.80495 ft	3	1206.670 ft	13.97100 ft	17.77600 ft	0.00139 ft
 CP202-CP203 (E15)	Enabled	0.35300 ft	0.00005 ft	0.35305 ft	3	1279.060 ft	14.66000 ft	14.30700 ft	0.00143 ft
 CP203-CP204 (E16)	Enabled	1.37100 ft	0.00004 ft	1.37104 ft	2	921.050 ft	12.06200 ft	10.69100 ft	0.00122 ft
 CP204-CP205 (E17)	Enabled	0.50600 ft	0.00003 ft	0.50603 ft	2	771.950 ft	8.75600 ft	8.25000 ft	0.00111 ft
 CP205-CP206 (E18)	Enabled	-41.54300 ft	0.00010 ft	-41.54290 ft	7	2356.120 ft	15.81400 ft	57.35700 ft	0.00195 ft
 CP206-CP207 (E19)	Enabled	-3.91800 ft	0.00010 ft	-3.91790 ft	5	2453.990 ft	22.02100 ft	25.93900 ft	0.00199 ft

 CP207-CP208 (E20)	Enabled	4.72300 ft	0.00002 ft	4.72302 ft	1	427.190 ft	7.23100 ft	2.50800 ft	0.00083 ft
 CP208-CP209 (E21)	Enabled	7.73100 ft	0.00003 ft	7.73103 ft	2	817.720 ft	15.42300 ft	7.69200 ft	0.00115 ft
 CP209-CP210 (E22)	Enabled	-9.52700 ft	0.00008 ft	-9.52692 ft	4	1932.340 ft	14.39100 ft	23.91800 ft	0.00176 ft
 CP210-CP211 (E23)	Enabled	0.72200 ft	0.00002 ft	0.72202 ft	1	564.950 ft	4.07400 ft	3.35200 ft	0.00095 ft
 CP211-CP212 (E24)	Enabled	-1.47900 ft	0.00003 ft	-1.47897 ft	2	786.580 ft	8.50200 ft	9.98100 ft	0.00112 ft
 CP212-CP213 (E25)	Enabled	2.12400 ft	0.00006 ft	2.12406 ft	3	1416.930 ft	15.51500 ft	13.39100 ft	0.00151 ft
 CP213-CP214 (E26)	Enabled	-1.04400 ft	0.00003 ft	-1.04397 ft	2	611.480 ft	10.09400 ft	11.13800 ft	0.00099 ft
 CP214-CP215 (E27)	Enabled	3.46100 ft	0.00004 ft	3.46104 ft	2	848.690 ft	13.49500 ft	10.03400 ft	0.00117 ft
 CP215-CP216 (E28)	Enabled	11.83600 ft	0.00004 ft	11.83604 ft	3	1063.570 ft	21.76400 ft	9.92800 ft	0.00131 ft
 CP216-CP217 (E29)	Enabled	-2.83500 ft	0.00005 ft	-2.83495 ft	3	1081.880 ft	11.91900 ft	14.75400 ft	0.00132 ft
 CP217-CP218 (E30)	Enabled	4.12000 ft	0.00003 ft	4.12003 ft	2	604.000 ft	13.20400 ft	9.08400 ft	0.00099 ft
 CP218-CP3 (E31)	Enabled	2.40500 ft	0.00010 ft	2.40510 ft	6	2274.420 ft	38.28100 ft	35.87600 ft	0.00191 ft

Run - 1 (N2) Reduced Coordinates

Point ID	Status	Elevation
 CP4	Enabled	714.39200 ft
 CP3	Enabled	725.59700 ft

Date: 7/9/2013 3:06:35 PM	Project: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS Elevation.vce	Trimble Business Center
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Project Information	Coordinate System
Name: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS Elevation.vce	Name: Scale Only
Size: 272 KB	Datum:
Modified: 6/10/2013 4:24:10 PM (UTC:-4)	Zone:
Time zone: Eastern Standard Time	Geoid:
Reference number:	Vertical datum:
Description:	

Level Report

Imported file: [STLOOP.DAT](#)

Instrument: DiNi


Run - 1 Raw Observations

Raw Misclosure: -0.01500 ft
 Σ BS Distances: 3587.410 ft
 Σ FS Distances: 3944.850 ft
Run Length: 7532.260 ft

Closure Check: 0.04 feet x (\sqrt{E}), E = Length of loop in miles
0.04 x ($\sqrt{1.19}$) = 0.047 > 0.015 ✓







Reduction: Adjusted Values



Create	Point ID	BS	IS	FS	Δ Elevation	Raw Elevation	Correction	Adj. Elevation	Type	Distance	Description
--------	----------	----	----	----	--------------------	---------------	------------	----------------	------	----------	-------------

<input checked="" type="checkbox"/>	CP2	<input checked="" type="checkbox"/> 4.49700 ft			0.00000 ft	767.187 ft	0.00000 ft	767.187 ft 	Benchmark	227.300 ft	1
<input checked="" type="checkbox"/>	70116			<input checked="" type="checkbox"/> 5.12200 ft	-0.62500 ft	766.562 ft	0.00089 ft	766.563 ft	Computed	221.750 ft	1
	70116	<input checked="" type="checkbox"/> 4.57100 ft								106.100 ft	1
<input checked="" type="checkbox"/>	70115			<input checked="" type="checkbox"/> 6.09100 ft	-1.52000 ft	765.042 ft	0.00164 ft	765.044 ft	Computed	268.270 ft	1
	70115	<input checked="" type="checkbox"/> 7.22300 ft								277.690 ft	3
<input type="checkbox"/>	1			<input checked="" type="checkbox"/> 3.02500 ft	4.19800 ft	769.240 ft	0.00254 ft	769.243 ft	Computed	176.740 ft	3
	1	<input checked="" type="checkbox"/> 8.00200 ft								247.110 ft	3
<input type="checkbox"/>	2			<input checked="" type="checkbox"/> 2.15900 ft	5.84300 ft	775.083 ft	0.00346 ft	775.086 ft	Computed	211.940 ft	3
	2	<input checked="" type="checkbox"/> 7.22500 ft								310.560 ft	3
<input type="checkbox"/>	3			<input checked="" type="checkbox"/> 2.24000 ft	4.98500 ft	780.068 ft	0.00464 ft	780.073 ft	Computed	284.610 ft	3
	3	<input checked="" type="checkbox"/> 5.06700 ft								16.500 ft	3
<input checked="" type="checkbox"/>	70119			<input checked="" type="checkbox"/> 4.39100 ft	0.67600 ft	780.744 ft	0.00471 ft	780.749 ft	Computed	18.140 ft	3
	70119	<input checked="" type="checkbox"/> 4.43400 ft								215.580 ft	3
<input checked="" type="checkbox"/>	MND502			<input checked="" type="checkbox"/> 7.68200 ft	-3.24800 ft	777.496 ft	0.00555 ft	777.502 ft	Computed	206.950 ft	3
	MND502	<input checked="" type="checkbox"/> 4.58200 ft								97.570 ft	3
<input checked="" type="checkbox"/>	MND503			<input checked="" type="checkbox"/> 6.46800 ft	-1.88600 ft	775.610 ft	0.00594 ft	775.616 ft	Computed	95.640 ft	3
	MND503	<input checked="" type="checkbox"/> 5.76700 ft								181.860 ft	3
<input type="checkbox"/>	4			<input checked="" type="checkbox"/> 5.67100 ft	0.09600 ft	775.706 ft	0.00681 ft	775.713 ft	Computed	256.790 ft	3
	4	<input checked="" type="checkbox"/> 8.47900 ft								266.670 ft	3
<input type="checkbox"/>	5			<input checked="" type="checkbox"/> 1.56900 ft	6.91000 ft	782.616 ft	0.00788 ft	782.624 ft	Computed	270.960 ft	3
	5	<input checked="" type="checkbox"/> 5.83200 ft								68.860 ft	3
<input checked="" type="checkbox"/>	71213			<input checked="" type="checkbox"/> 5.12900 ft	0.70300 ft	783.319 ft	0.00818 ft	783.327 ft	Computed	79.530 ft	3
	71213	<input checked="" type="checkbox"/> 6.93200 ft								188.090 ft	3
<input checked="" type="checkbox"/>	71212			<input checked="" type="checkbox"/> 4.61000 ft	2.32200 ft	785.641 ft	0.00905 ft	785.650 ft	Computed	249.110 ft	3

	71212	✔ 4.48800 ft								280.380 ft	3
📐	6		✔ 7.82700 ft	-3.33900 ft	782.302 ft	0.01005 ft	782.312 ft	Computed	223.820 ft	3	
	6	✔ 2.75600 ft							80.770 ft	3	
📐	7		✔ 12.10800 ft	-9.35200 ft	772.950 ft	0.01073 ft	772.961 ft	Computed	259.250 ft	3	
	7	✔ 5.78200 ft							121.490 ft	3	
📐	8		✔ 1.61200 ft	4.17000 ft	777.120 ft	0.01122 ft	777.131 ft	Computed	124.110 ft	3	
	8	✔ 7.54500 ft							86.710 ft	3	
📐	9		✔ 3.18300 ft	4.36200 ft	781.482 ft	0.01171 ft	781.494 ft	Computed	161.380 ft	3	
	9	✔ 5.07900 ft							220.240 ft	3	
📐	10		✔ 5.82200 ft	-0.74300 ft	780.739 ft	0.01254 ft	780.752 ft	Computed	195.960 ft	3	
	10	✔ 4.80400 ft							187.430 ft	3	
✔	70118		✔ 5.79300 ft	-0.98900 ft	779.750 ft	0.01322 ft	779.763 ft	Computed	152.530 ft	3	
	70118	✔ 3.82600 ft							250.000 ft	3	
📐	11		✔ 8.65100 ft	-4.82500 ft	774.925 ft	0.01418 ft	774.939 ft	Computed	231.790 ft	3	
	11	✔ 5.95400 ft							156.500 ft	3	
✔	CP1		✔ 6.25700 ft	-0.30300 ft	774.622 ft	0.01500 ft	774.637 ft 📐	Benchmark	255.580 ft	3	

Run - 1 (N1) Reduced Observations

Observation	Status	Raw Δ Elevation	Correction	Final Δ Elevation	Setups	Length	Σ BS Readings	Σ FS Readings	Std. Error
 CP2-70116 (E1)	Enabled	-0.62500 ft	0.00089 ft	-0.62411 ft	1	449.050 ft	4.49700 ft	5.12200 ft	0.00085 ft
 70116-70115 (E2)	Enabled	-1.52000 ft	0.00075 ft	-1.51925 ft	1	374.370 ft	4.57100 ft	6.09100 ft	0.00078 ft
 70115-70119 (E3)	Enabled	15.70200 ft	0.00307 ft	15.70507 ft	4	1543.290 ft	27.51700 ft	11.81500 ft	0.00158 ft
 70119-MND502 (E4)	Enabled	-3.24800 ft	0.00084 ft	-3.24716 ft	1	422.530 ft	4.43400 ft	7.68200 ft	0.00082 ft
 MND502-MND503 (E5)	Enabled	-1.88600 ft	0.00038 ft	-1.88562 ft	1	193.210 ft	4.58200 ft	6.46800 ft	0.00056 ft
 MND503-71213 (E6)	Enabled	7.70900 ft	0.00224 ft	7.71124 ft	3	1124.670 ft	20.07800 ft	12.36900 ft	0.00134 ft

 71213-71212 (E7)	Enabled	2.32200 ft	0.00087 ft	2.32287 ft	1	437.200 ft	6.93200 ft	4.61000 ft	0.00084 ft
 71212-70118 (E8)	Enabled	-5.89100 ft	0.00417 ft	-5.88683 ft	6	2094.070 ft	30.45400 ft	36.34500 ft	0.00183 ft
 70118-CP1 (E9)	Enabled	-5.12800 ft	0.00178 ft	-5.12622 ft	2	893.870 ft	9.78000 ft	14.90800 ft	0.00120 ft

Run - 1 (N1) Reduced Coordinates

Point ID	Status	Elevation
 CP2	Enabled	767.18700 ft
 CP1	Enabled	774.63700 ft

Date: 7/9/2013 3:17:19 PM	Project: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS Elevation.vce	Trimble Business Center
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Project Information	Coordinate System
Name: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS Elevation.vce	Name: Scale Only
Size: 272 KB	Datum:
Modified: 6/10/2013 4:24:10 PM (UTC:-4)	Zone:
Time zone: Eastern Standard Time	Geoid:
Reference number:	Vertical datum:
Description:	

Level Report

Imported file: [STLOOP.DAT](#)

Instrument: DiNi

Run - 1 Raw Observations

Raw Misclosure: 0.02000 ft
 Σ BS Distances: 3988.910 ft
 Σ FS Distances: 3937.970 ft
Run Length: 7926.880 ft

Closure Check: 0.04 feet x (\sqrt{E}), E = Length of loop in miles
0.04 x ($\sqrt{1.501}$) = 0.049 > 0.02 ✓

Reduction:







Adjusted Values















Create	Point ID	BS	IS	FS	Δ Elevation	Raw Elevation	Correction	Adj. Elevation	Type	Distance	Description
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	CP206	4.77600 ft			0.00000 ft	707.277 ft	0.00000 ft	707.277 ft	Benchmark	255.080 ft	CP206
	TP1			5.77600 ft	-1.00000 ft	706.277 ft	-0.00127 ft	706.276 ft	Computed	248.650 ft	
	TP1	4.09700 ft								255.150 ft	
	71-205			7.20200 ft	-3.10500 ft	703.172 ft	-0.00223 ft	703.170 ft	Computed	126.180 ft	71-205
	71-205	7.93400 ft								170.570 ft	
	TP2			0.81300 ft	7.12100 ft	710.293 ft	-0.00317 ft	710.290 ft	Computed	200.980 ft	
	TP2	10.99500 ft								178.510 ft	
	71-206			1.91100 ft	9.08400 ft	719.377 ft	-0.00415 ft	719.373 ft	Computed	210.170 ft	71-206
	71-206	2.16600 ft								223.850 ft	
	TP3			4.18800 ft	-2.02200 ft	717.355 ft	-0.00540 ft	717.350 ft	Computed	269.650 ft	
	TP3	6.60600 ft								218.900 ft	
	TP4			3.53000 ft	3.07600 ft	720.431 ft	-0.00657 ft	720.424 ft	Computed	247.640 ft	
	TP4	6.10700 ft								94.130 ft	
	71-207			4.77600 ft	1.33100 ft	721.762 ft	-0.00713 ft	721.755 ft	Computed	125.920 ft	71-207
	71-207	5.92600 ft								260.920 ft	
	TP5			6.05700 ft	-0.13100 ft	721.631 ft	-0.00840 ft	721.623 ft	Computed	244.590 ft	
	TP5	5.22500 ft								314.110 ft	
	71-208			6.95900 ft	-1.73400 ft	719.897 ft	-0.01008 ft	719.887 ft	Computed	351.710 ft	71-208
	71-208	4.99200 ft								222.510 ft	
	TP6			9.37100 ft	-4.37900 ft	715.518 ft	-0.01123 ft	715.507 ft	Computed	231.890 ft	
	TP6	0.09400 ft								170.180 ft	
	TP7			7.28800 ft	-7.19400 ft	708.324 ft	-0.01208 ft	708.312 ft	Computed	166.310 ft	
	TP7	5.34900 ft								213.680 ft	
	71-209			6.08800 ft	-0.73900 ft	707.585 ft	-0.01313 ft	707.572 ft	Computed	203.250 ft	71-209



	71-209	✓ 1.70000 ft								166.080 ft	
✓	TP8		✓ 9.97000 ft	-8.27000 ft	699.315 ft	-0.01396 ft	699.301 ft	Computed	162.470 ft		
	TP8	✓ 5.27800 ft							202.360 ft		
✓	TP9		✓ 0.73100 ft	4.54700 ft	703.862 ft	-0.01498 ft	703.847 ft	Computed	201.210 ft		
	TP9	✓ 10.27700 ft							197.050 ft		
✓	TP10		✓ 0.12200 ft	10.15500 ft	714.017 ft	-0.01599 ft	714.001 ft	Computed	202.460 ft		
	TP10	✓ 8.80200 ft							145.640 ft		
✓	TP11		✓ 2.00900 ft	6.79300 ft	720.810 ft	-0.01676 ft	720.793 ft	Computed	162.240 ft		
	TP11	✓ 6.74000 ft							255.280 ft		
✓	315-302		✓ 4.69400 ft	2.04600 ft	722.856 ft	-0.01773 ft	722.838 ft	Computed	127.330 ft	315-302	
	315-302	✓ 2.49000 ft							63.480 ft		
✓	TP12		✓ 10.78300 ft	-8.29300 ft	714.563 ft	-0.01819 ft	714.545 ft	Computed	118.540 ft		
	TP12	✓ 1.64300 ft							62.730 ft		
✓	TP13		✓ 8.21700 ft	-6.57400 ft	707.989 ft	-0.01855 ft	707.970 ft	Computed	82.120 ft		
	TP13	✓ 6.38000 ft							318.700 ft		
✓	CP215		✓ 4.27800 ft	2.10200 ft	710.091 ft	-0.02000 ft	710.071 ft	Benchmark	254.660 ft	CP215	

Run - 1 (N4) Reduced Observations

Observation	Status	Raw Δ Elevation	Correction	Final Δ Elevation	Setups	Length	Σ BS Readings	Σ FS Readings	Std. Error
 CP206-TP1 (E52)	Enabled	-1.00000 ft	-0.00127 ft	-1.00127 ft	1	503.730 ft	4.77600 ft	5.77600 ft	0.00090 ft
 TP1-71-205 (E53)	Enabled	-3.10500 ft	-0.00096 ft	-3.10596 ft	1	381.330 ft	4.09700 ft	7.20200 ft	0.00078 ft
 71-205-TP2 (E54)	Enabled	7.12100 ft	-0.00094 ft	7.12006 ft	1	371.550 ft	7.93400 ft	0.81300 ft	0.00077 ft
 TP2-71-206 (E55)	Enabled	9.08400 ft	-0.00098 ft	9.08302 ft	1	388.680 ft	10.99500 ft	1.91100 ft	0.00079 ft
 71-206-TP3 (E56)	Enabled	-2.02200 ft	-0.00125 ft	-2.02325 ft	1	493.500 ft	2.16600 ft	4.18800 ft	0.00089 ft
 TP3-TP4 (E57)	Enabled	3.07600 ft	-0.00118 ft	3.07482 ft	1	466.540 ft	6.60600 ft	3.53000 ft	0.00087 ft

 TP4-71-207 (E58)	Enabled	1.33100 ft	-0.00056 ft	1.33044 ft	1	220.050 ft	6.10700 ft	4.77600 ft	0.00059 ft
 71-207-TP5 (E59)	Enabled	-0.13100 ft	-0.00128 ft	-0.13228 ft	1	505.510 ft	5.92600 ft	6.05700 ft	0.00090 ft
 TP5-71-208 (E60)	Enabled	-1.73400 ft	-0.00168 ft	-1.73568 ft	1	665.820 ft	5.22500 ft	6.95900 ft	0.00103 ft
 71-208-TP6 (E61)	Enabled	-4.37900 ft	-0.00115 ft	-4.38015 ft	1	454.400 ft	4.99200 ft	9.37100 ft	0.00085 ft
 TP6-TP7 (E62)	Enabled	-7.19400 ft	-0.00085 ft	-7.19485 ft	1	336.490 ft	0.09400 ft	7.28800 ft	0.00074 ft
 TP7-71-209 (E63)	Enabled	-0.73900 ft	-0.00105 ft	-0.74005 ft	1	416.930 ft	5.34900 ft	6.08800 ft	0.00082 ft
 71-209-TP8 (E64)	Enabled	-8.27000 ft	-0.00083 ft	-8.27083 ft	1	328.550 ft	1.70000 ft	9.97000 ft	0.00073 ft
 TP8-TP9 (E65)	Enabled	4.54700 ft	-0.00102 ft	4.54598 ft	1	403.570 ft	5.27800 ft	0.73100 ft	0.00081 ft
 TP9-TP10 (E66)	Enabled	10.15500 ft	-0.00101 ft	10.15399 ft	1	399.510 ft	10.27700 ft	0.12200 ft	0.00080 ft
 TP10-TP11 (E67)	Enabled	6.79300 ft	-0.00078 ft	6.79222 ft	1	307.880 ft	8.80200 ft	2.00900 ft	0.00070 ft
 TP11-315-302 (E68)	Enabled	2.04600 ft	-0.00097 ft	2.04503 ft	1	382.610 ft	6.74000 ft	4.69400 ft	0.00078 ft
 315-302-TP12 (E69)	Enabled	-8.29300 ft	-0.00046 ft	-8.29346 ft	1	182.020 ft	2.49000 ft	10.78300 ft	0.00054 ft
 TP12-TP13 (E70)	Enabled	-6.57400 ft	-0.00037 ft	-6.57437 ft	1	144.850 ft	1.64300 ft	8.21700 ft	0.00048 ft
 TP13-CP215 (E71)	Enabled	2.10200 ft	-0.00145 ft	2.10055 ft	1	573.360 ft	6.38000 ft	4.27800 ft	0.00096 ft

Run - 1 (N4) Reduced Coordinates

Point ID	Status	Elevation
 CP206	Enabled	707.27700 ft
 CP215	Enabled	710.07100 ft

Date: 7/9/2013 2:43:00 PM	Project: O:\2012\2012048\FRA\77372\survey\rawdata\77372 Readjustment Level Data Based on COC5-83 GPS	Trimble Business Center
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Project Control Monument Coordinate Table
(Prior to vertical adjustment to DLZ control)

PROJECT: FRA-070-12.68							REPORT DATE: 5/15/2013		
PID: 77372							PREPARED BY: TDM		
							CHECKED BY: SLM		
POINT NO.	DESCRIPTION	MONUMENT TYPE	POSITIONING METHOD	GRID COORDINATES		ORTHO HEIGHT GPS (M)	PROJECT COORDINATES		ORTHO HEIGHT LEVELED (USFT)
				NORTHING (M)	EASTING (M)		NORTHING (USFT)	EASTING (USFT)	
CP206	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	215442.8984	556740.6434	215.5721	706832.028	1826572.647	707.277
CP207	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	215452.9121	555995.0742	214.3931	706864.882	1824126.452	703.359
CP209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	215825.6871	555927.7795	218.1759	708087.949	1823905.659	715.813
CP210	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	216390.3326	555765.4092	215.2698	709940.538	1823372.926	706.286
CP215	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	217055.5742	555855.2393	216.4261	712123.180	1823667.657	710.071
CP216	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	216862.7874	556079.6326	220.0342	711490.651	1824403.886	721.907
070-116	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	217008.7588	558219.9513	233.6157	711969.580	1831426.223	766.563
071-209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	216585.1937	555925.4486	215.6662	710579.873	1823898.012	707.572

* Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project

Project Control Monument Elevation Difference Table
(Prior to vertical adjustment to DLZ control)

PROJECT: FRA-070-12.68					REPORT DATE: 5/15/2013	
PID: 77372					PREPARED BY: TDM	
					CHECKED BY: SLM	
POINT NO.	DESCRIPTION	MONUMENT TYPE	POSITIONING METHOD	ORTHO HEIGHT GPS (USFT)	ORTHO HEIGHT LEVELED (USFT)	Δz (USFT)
CP206	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	707.256	707.277	0.021
CP207	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	703.388	703.359	-0.029
CP209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	715.799	715.813	0.014
CP210	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	706.264	706.286	0.022
CP215	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	710.058	710.071	0.013
CP216	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	721.896	721.907	0.012
070-116	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	766.454	766.563	0.109
071-209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	707.565	707.572	0.007

**GPD - DLZ CONTROL POINT
HORIZONTAL COORDINATE COMPARISON**

POINT ID	PROJECT GROUND NORTHING	PROJECT GROUND EASTING
MAG-MD-512		
GPD	712338.094	1828604.402
DLZ	712338.063	1828604.393
Δ	0.031	0.009
MAG-DLZ_070-115		
GPD	712237.935	1831279.385
DLZ	712237.957	1831279.373
Δ	-0.022	0.012
IPIPE-DLZ 070-116		
GPD	711969.580	1831426.223
DLZ	711969.611	1831426.233
Δ	-0.031	-0.010
IPIPE-DLZ 071-209		
GPD	710579.873	1823898.012
DLZ	710579.903	1823898.001
Δ	-0.030	0.011

Project ground coordinates were obtained by radially scaling GPS derived GRID coordinate from Franklin County Monument "FRANK 143" by the Project Adjustment Factor 1.000043907 (provided by DLZ).

DLZ POINTS LEVELLED THROUGH EAST OF PROJECT 4B

DLZ POINT ID	DESCRIPTION	DLZ ELEVATION	GPD ELEVATION	Δ ELEVATION	GPD ELEVATION AFTER APPLICATION OF COMBINED AVERAGE Δ	Δ ELEVATION AFTER ADJUSTEMENT
070-115	MAG NAIL	764.92	765.044	-0.124	764.970	-0.050
070-116	PIPE W/CAP	766.46	766.563	-0.103	766.489	-0.029
070-118	MINE SPIKE	779.70	779.763	-0.063	779.689	0.011
070-119	PIPE W/CAP	780.64	780.749	-0.109	780.675	-0.035
MND-502	MAG NAIL	777.42	777.502	-0.082	777.428	-0.008
MND-503	MAG NAIL	775.54	775.616	-0.076	775.542	-0.002
071-212	MAG NAIL	785.55	785.650	-0.100	785.576	-0.026
071-213	MAG NAIL	783.24	783.327	-0.087	783.253	-0.013
			AVERAGE Δ	-0.093	-0.019	

DLZ POINTS LEVELLED THROUGH WEST OF PROJECT 4B

DLZ POINT ID	DESCRIPTION	DLZ ELEVATION	GPD ELEVATION	Δ ELEVATION	GPD ELEVATION AFTER APPLICATION OF COMBINED AVERAGE Δ	Δ ELEVATION AFTER ADJUSTEMENT
071-205	PIPE W/CAP	703.12	703.170	-0.050	703.096	0.024
071-206	PIPE W/CAP	719.32	719.373	-0.053	719.299	0.021
071-207	PIPE W/CAP	721.71	721.755	-0.045	721.681	0.029
071-208	PIPE W/CAP	719.82	719.887	-0.067	719.813	0.007
071-209	PIPE W/CAP	707.50	707.572	-0.072	707.498	0.002
315-302	PIPE W/CAP	722.80	722.838	-0.038	722.764	0.036
			AVERAGE Δ	-0.054	0.019	

COMBINED AVERAGE Δ -0.074

GPD elevations were established based level loops holding CP4 (Project 4B) for elevation. Elevation of CP4 was derived from static GPS sessions using Franklin County Monument COC5-83.

Final Project Control Monument Coordinate Table

PROJECT: FRA-070-12.68				REPORT DATE: 5/15/2013		
PID: 77372				PREPARED BY: TDM		
				CHECKED BY: SLM		
POINT NO.	DESCRIPTION	MONUMENT TYPE	POSITIONING METHOD	PROJECT COORDINATES		ORTHO HEIGHT LEVELED* (USFT)
				NORTHING (USFT)	EASTING (USFT)	
CP206	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	706832.028	1826572.647	707.203
CP207	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	706864.882	1824126.452	703.285
CP209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	708087.949	1823905.659	715.739
CP210	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	709940.538	1823372.926	706.212
CP215	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	712123.180	1823667.657	709.997
CP216	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	711490.651	1824403.886	721.833
070-116	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	711969.580	1831426.223	766.489
071-209	Concrete Mon. w/2" Alum. Cap "PROJECT CONTROL"	Type A	Static	710579.873	1823898.012	707.498

*Elevations after -0.074 adjustment to DLZ control points.

Scaled Coordinates = Scale Northings and Eastings Radially from Franklin County Monument "FRANK 143" by the Project Adjustment Factor
Project Adjustment Factor 1.000043907. Factor was established by DLZ on the FRA-70-8.93 project.

PROJECT CONTROL POINTS



1" = 500'
0 500 1,000 Feet

FRA-070-12.68
PID #77372