



FUGRO GEOSPATIAL, INC.

Collection Report – USGS Lidar Acquisition

SD_Southwest_NRCS_SD_2018_D18

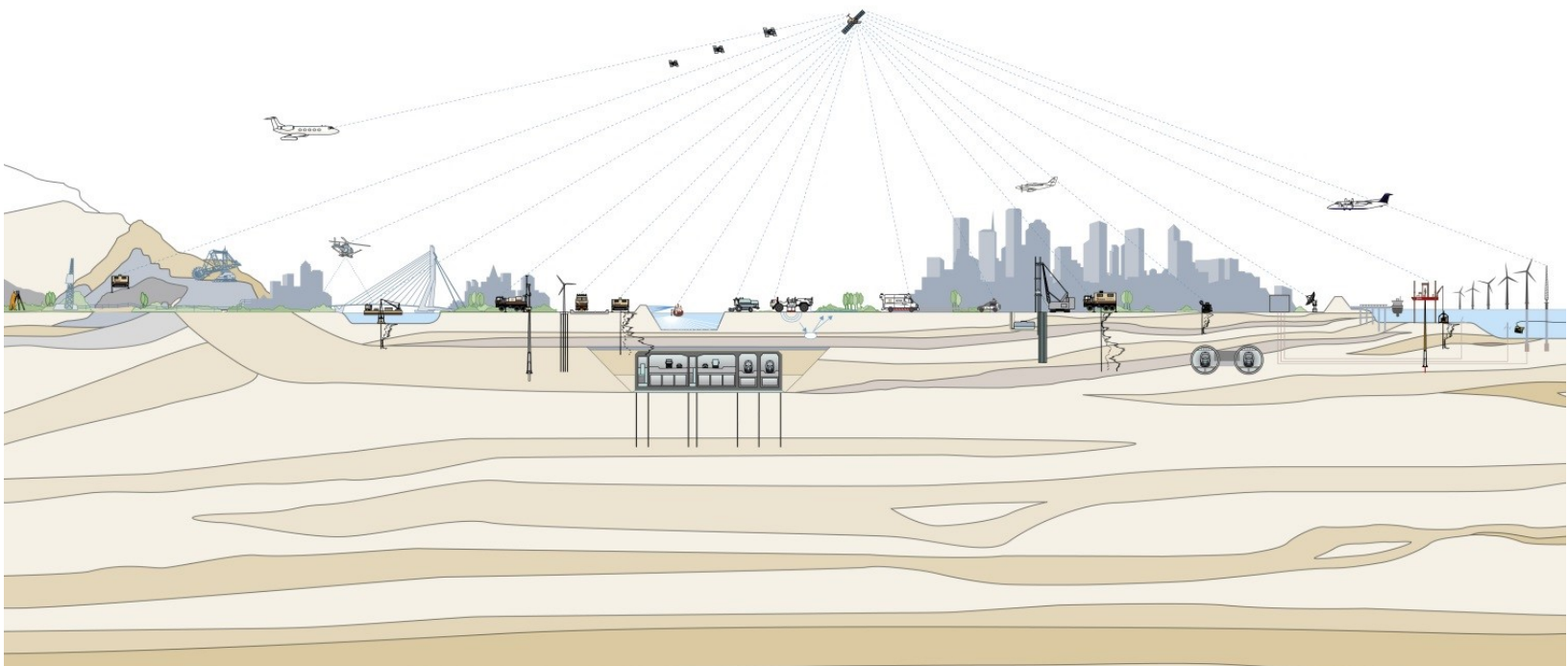
Block 2

Prepared for:

United States Geological Survey
1400 Independence Road
Rolla, MO 65401
(573) 308-3689

April 11, 2019

USGS Contract: G17PC00015
USGS Task Order: 140G0218F0051



Fugro was tasked with planning, acquiring, processing, and producing derivative products of high resolution lidar data (QL2+) collected at an aggregate nominal pulse spacing (ANPS) of 0.5 meters (4ppsm), including overlap, over Bennett, Custer, Fall River, Haakon, Jackson, Pennington, Shannon, and Todd Counties in South Dakota. The area of interest (AOI) covers approximately 14,386 square miles. A 100-meter buffer was added to the AOI; all products will be generated to the limit of this buffered boundary.

Lidar data, and derivative products produced in compliance with the task order will be based on the “**U.S. Geological Survey National Geospatial Program Lidar Base Specification Version 1.2**”.

The **Block 2** acquisition occurred during the acceptable collection windows that existed between 04/22/2018 and 12/17/2018.

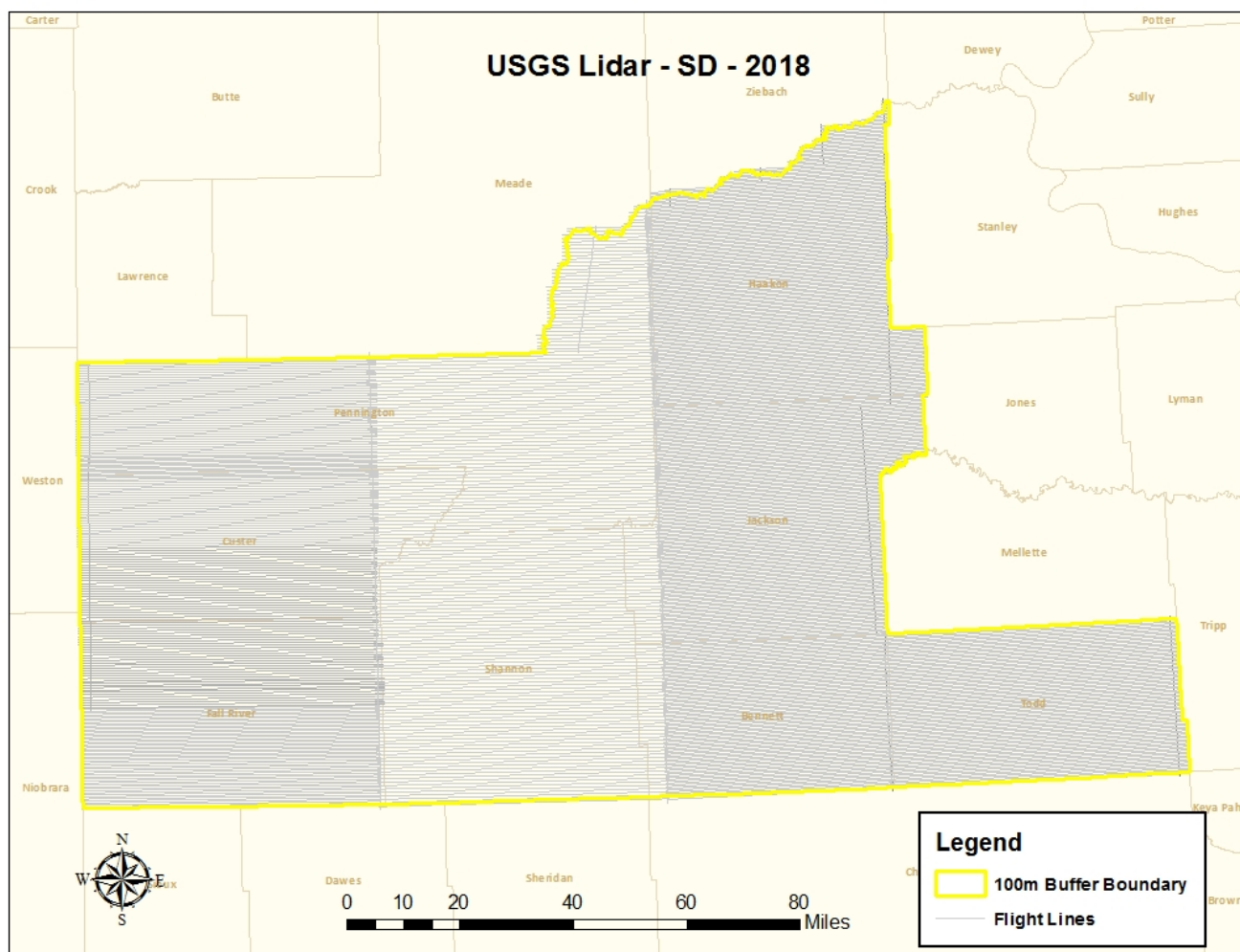


Figure 1: Flight plan

The following is detail on the **Block 2** lidar acquisition covering the South Dakota FY18 NRCS Lidar buffered boundary.

Collections: 59
Collection Dates: April 22nd – December 17th, 2018
Field of View (FOV): 60 deg (Riegl); 21-27 deg (ALS)
Average Point Density (planned): 4 ppsm
Flight Level(s) AMT: 2400-3250 ft (Riegl); 8400-8700 ft (ALS)
Sensor Type(s): Riegl LMS-Q680i, Riegl LMS-Q780, Leica ALS80
Sensor Serial Number(s): 165, 421, 118, 130

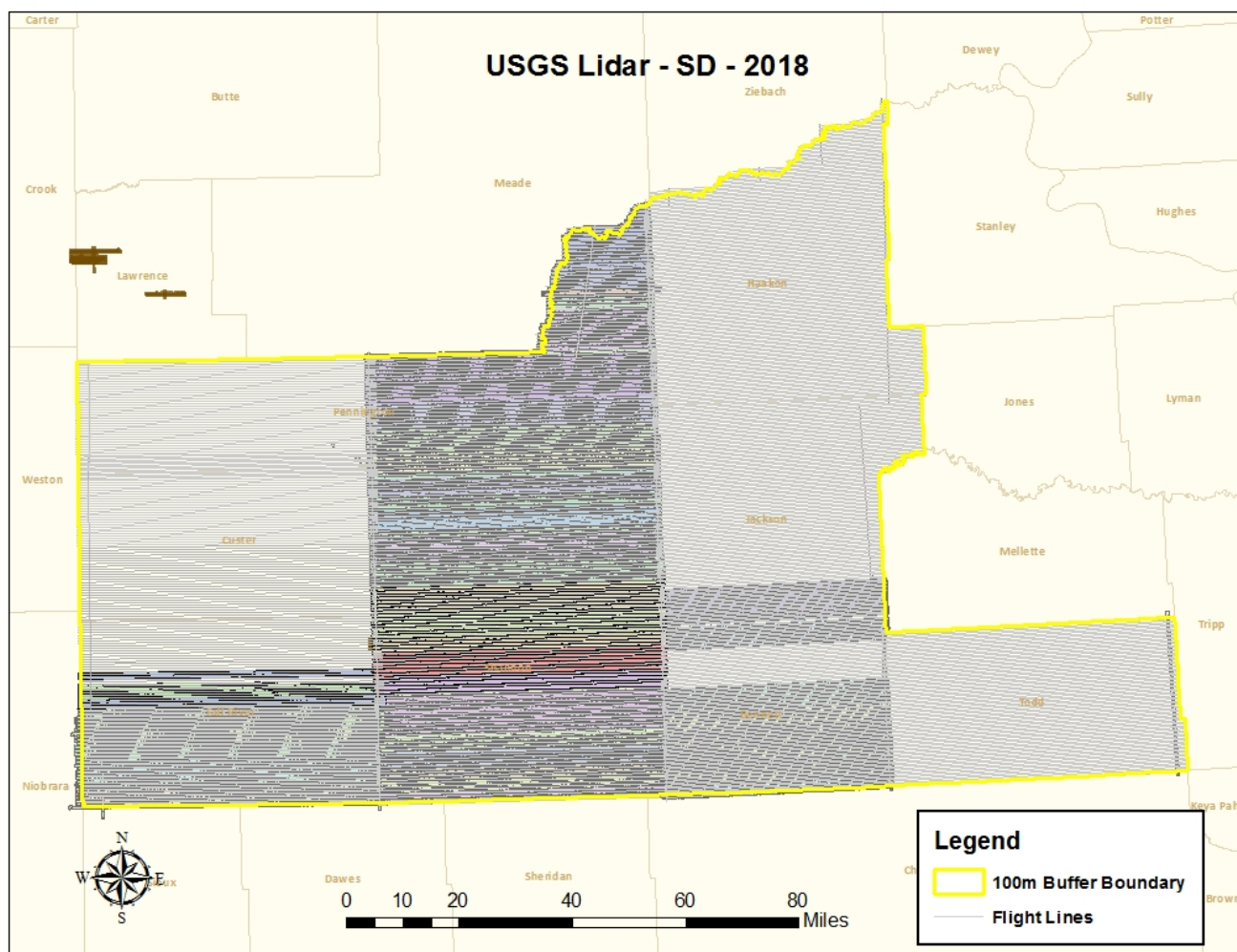


Figure 2: Executed Collection Footprints

All acquired lidar data was assessed and accepted for processing.

Below are the acquisition logs and GPS plots from the **Block 2** collections covering the South Dakota FY18 NRCS Lidar buffered boundary.

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Acquisition and Processing details ----- (April 22, 2018)4

Log: 180422_165_33780055_01



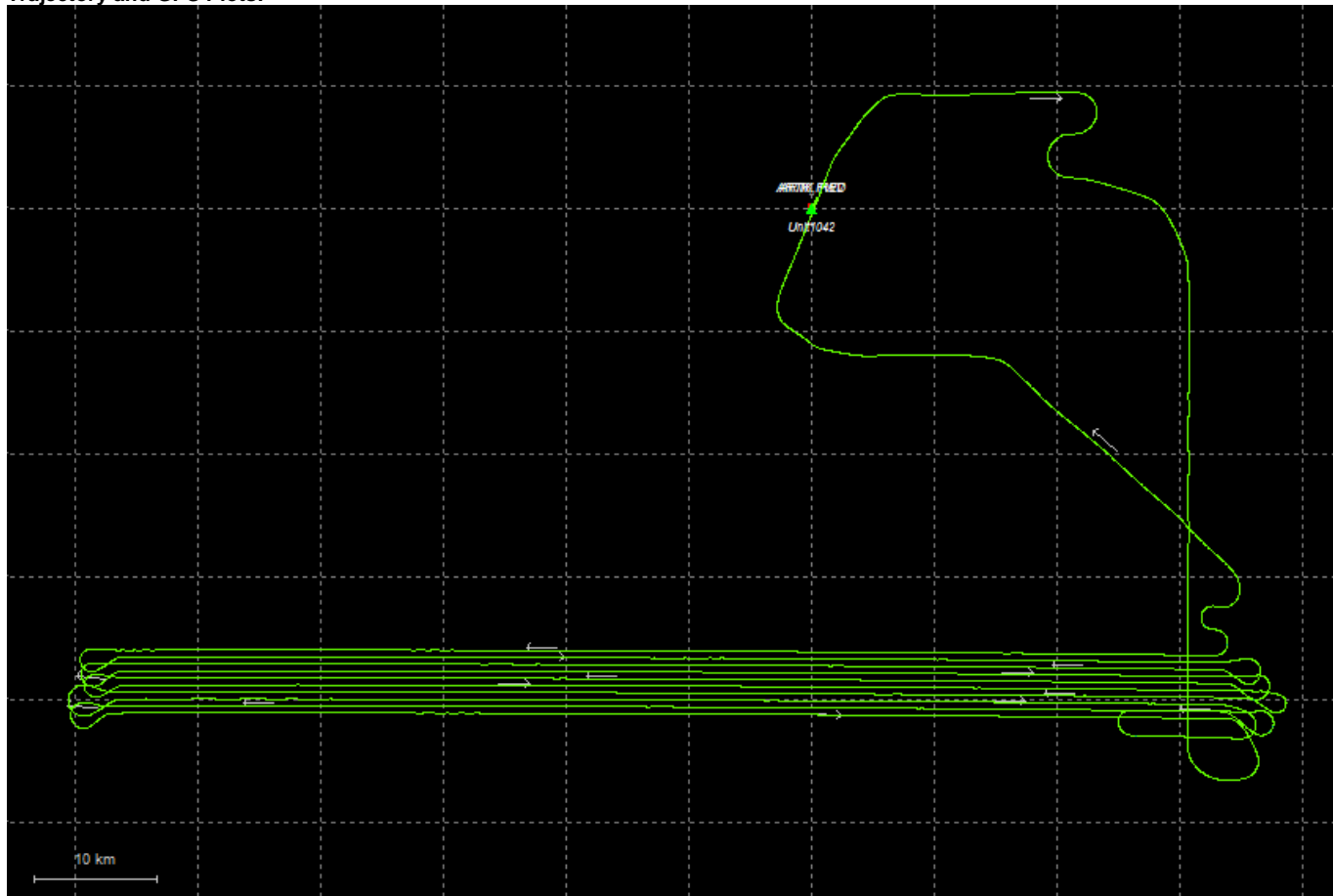
Fugro USA Land, Inc.

18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	13:46	982.1	KHSR	14:21	982.4	0:35	0.50	0.3	0103-Mob/Demob
2	KHSR	14:58	982.4	KHSR	20:30	987.4	5:32	5.50	5.0	0900-Production
3										

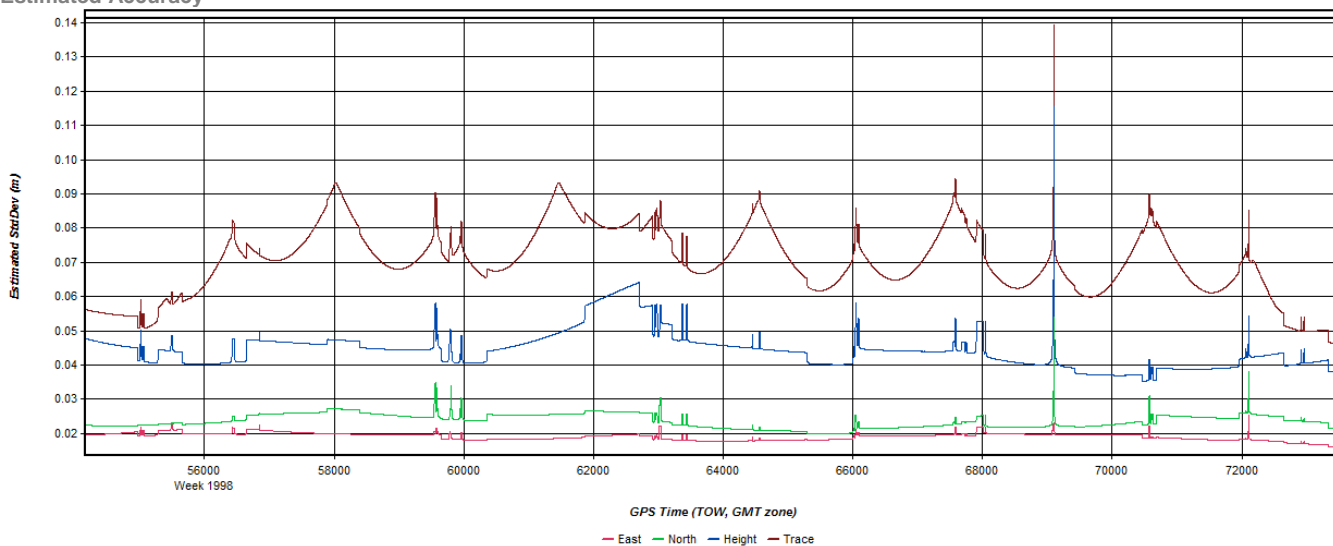
**Riegl
Flight Log**
AC80-50-00-02

FGI Job #	Project Name			System	Unit	IMU	Ground Temp °C		Min Range'	Data Logger Drives				
117019800	SD USGS FY18			680i	165		8.0	18.0	1542	15/16				
Flight Date	GPS Day	Lift	Sun°			Solar Times (UTC)	Pulse Rate	Flying Temp °C		Max Range'	Download Drive			
22-Apr-18	18-112	1					330	8.0	10.0	2933				
Mission ID (yyymmdd_Sen_Job_Lif)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	AltM Setting	Humidity @ Alt	Shipping Track	
180422_165_117019800_01	N97HC	KRAP	CCNS 8	-6	2400	130		130	2	0.440	30.21	30.16		
Pilot #1		Pilot #2		Operator #1		Operator #2								
Randy Green		Grant Cassell		Riley Forsyth										
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator		Data	
0382	KHSR		GR3-1	GR3-1	1.8					Unit10422o	Riley Forsyth			
Area	Flight #	Wpt	Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions		SVs	PDOP
	FGI	Client	From	To	Begin	End								
											ground static at KHSR		17	1.1
											s turn		17	1.0
W13X	2		67	1	29	0	15:30:30	15:38:20	S	5,495	130	cross tie line	17	1.1
W13F	53		195	1	85.4	0	15:42:10	16:05:32	W	5,708	117		16	1.2
	52		1	195	0	85.4	16:08:15	16:31:04	E	6,176	128	sporadic ground snow on the east side of line	18	1.0
	52		195	185	85.4	81	16:33:55	16:35:35	W	5,577	122	calibration line	17	1.1
	51		195	1	85.4	0	16:40:02	17:02:48	W	5,718	128	sporadic ground snow on the east side of line	17	1.1
	50		1	195	0	85.4	17:05:38	17:28:13	E	6,242	130		17	1.3
	49		195	1	85.4	0	17:31:44	17:54:25	W	5,787	126		17	1.2
	48		1	195	0	85.4	17:56:40	18:19:17	E	6,191	120		18	1.1
	47		195	1	85.4	0	18:22:09	18:44:48	W	5,794	126		18	1.1
	46		1	195	0	85.4	18:47:05	19:09:53	E	6,401	127		19	1.0
	45		195	1	85.4	0	19:12:11	19:35:03	W	5,683	126		17	1.2
	44		1	195	0	85.4	19:37:23	20:00:20	E	6,297	126		18	1.2
							20:00:25					s turn	17	1.3
							20:20:00	20:25:00				ground static at KHSR	20	1.0

Trajectory and GPS Plots:

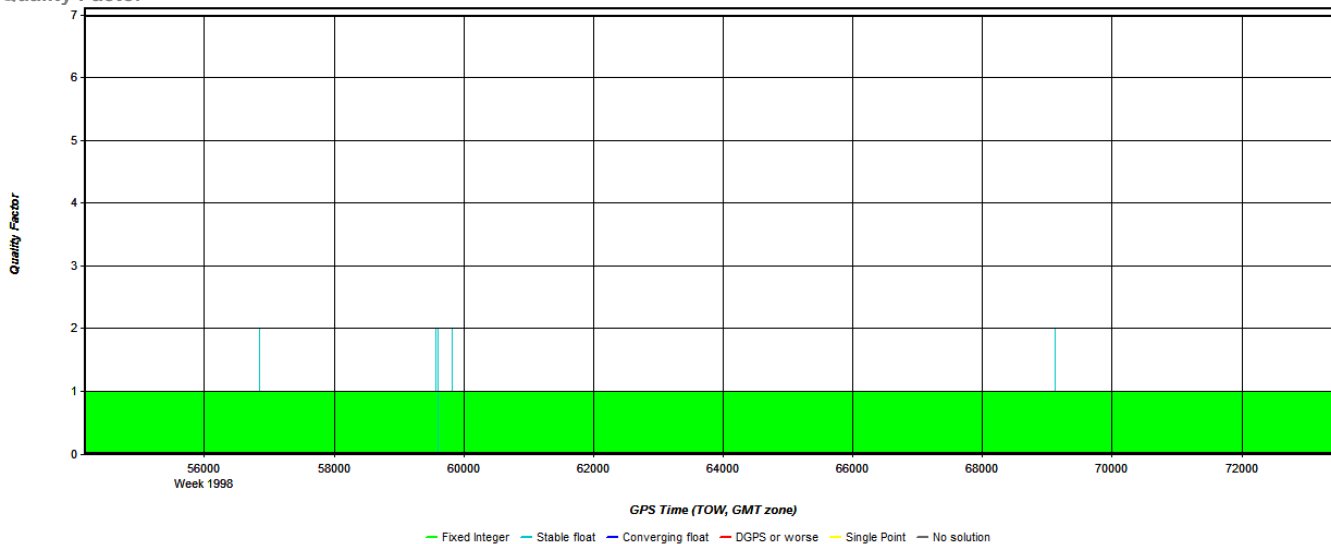


Estimated Accuracy

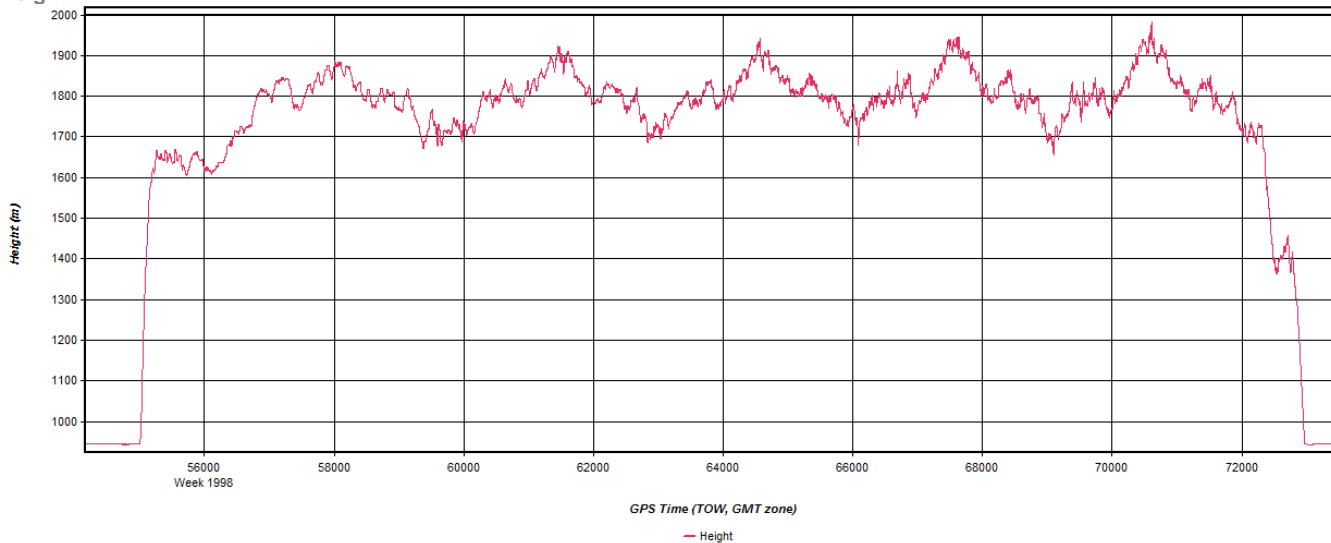




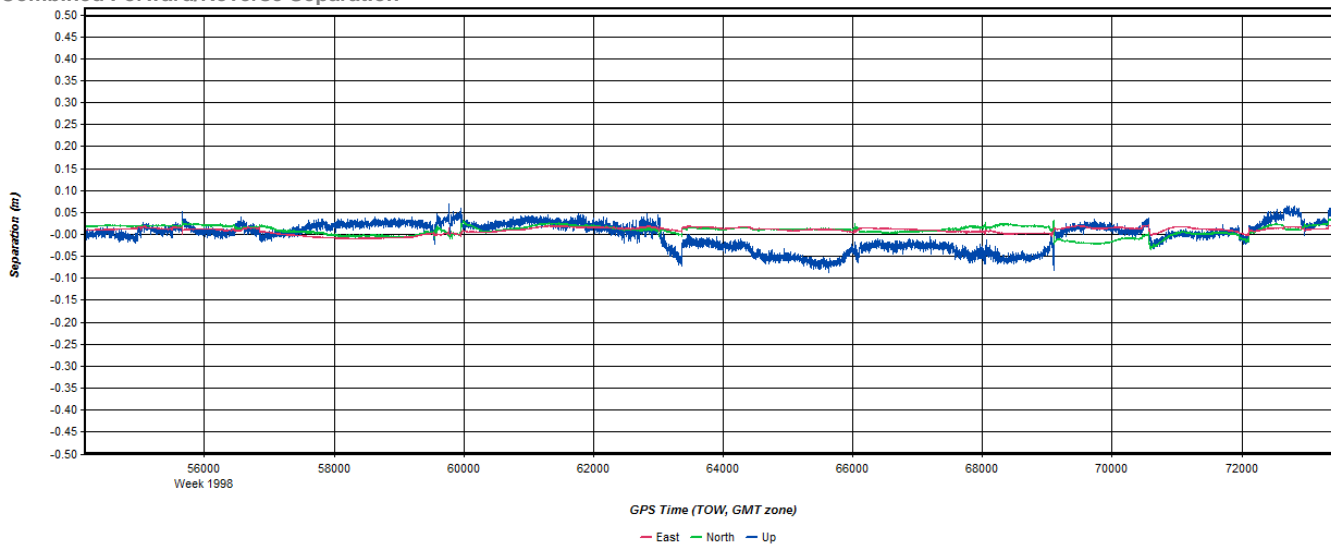
Quality Factor



Height



Combined Forward/Reverse Separation

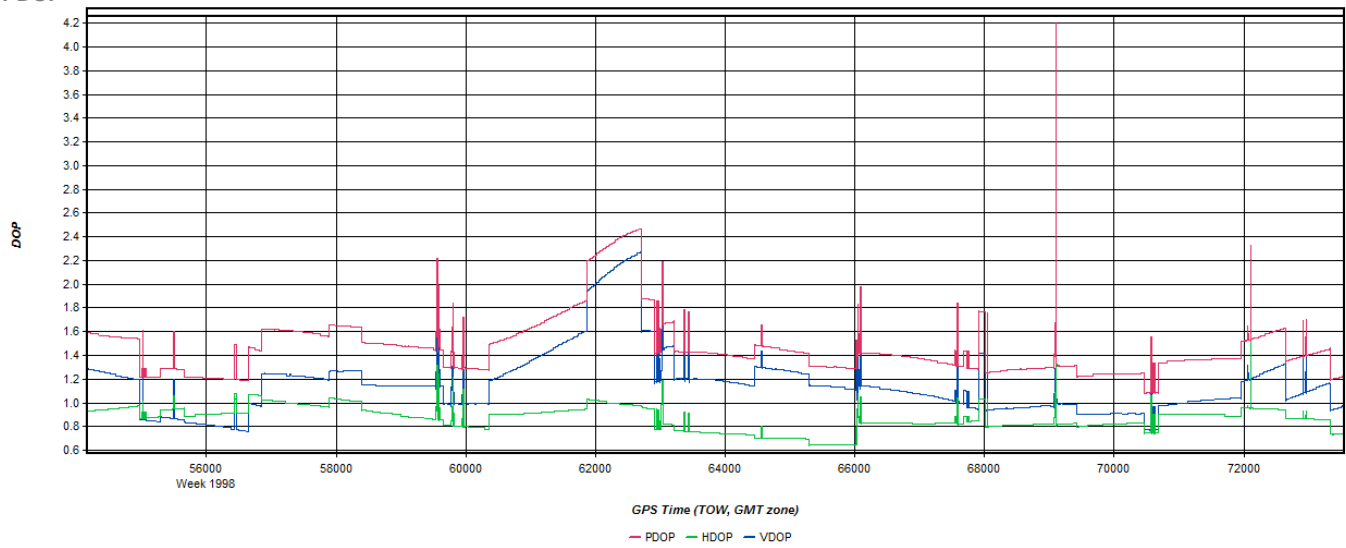


Combined Forward/Reverse Weighting

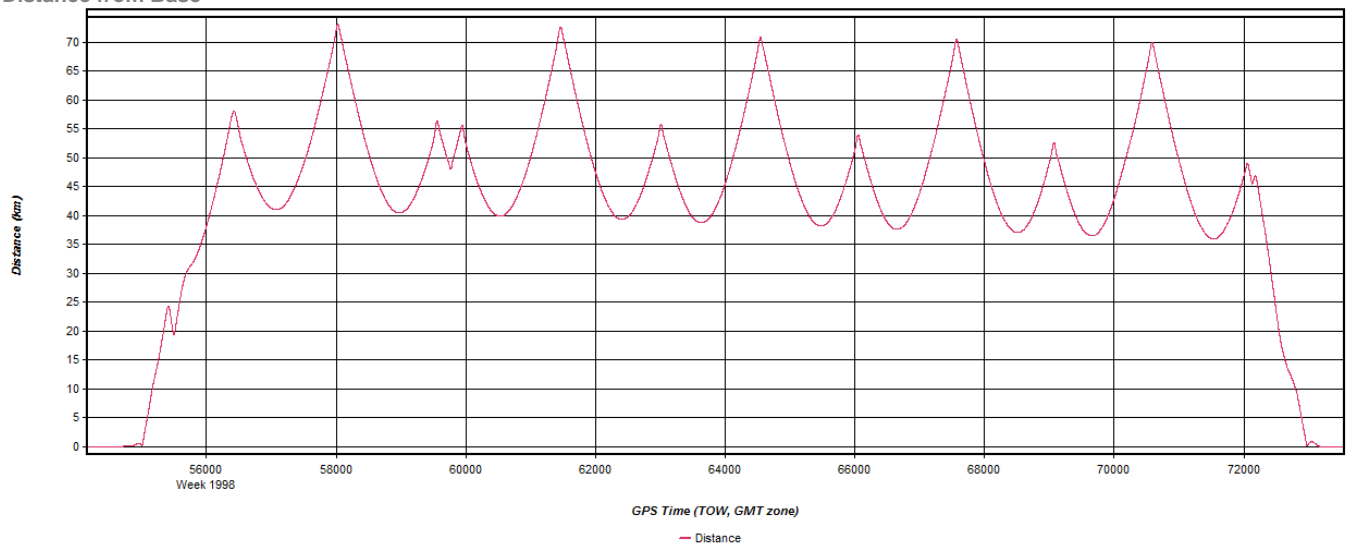


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PDOP

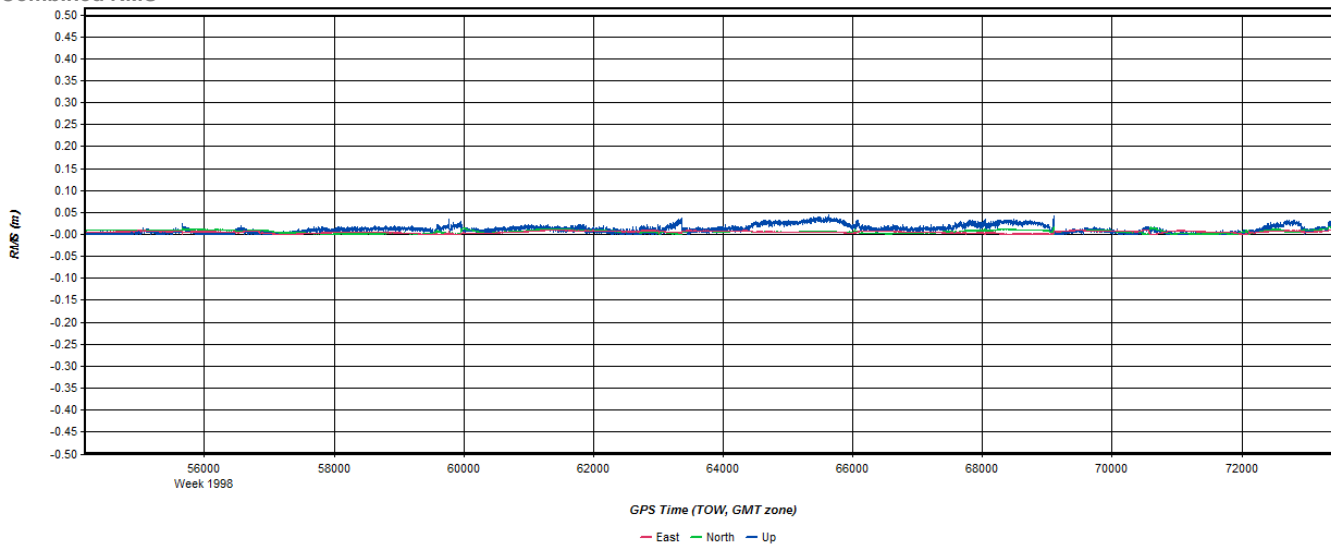


Distance from Base

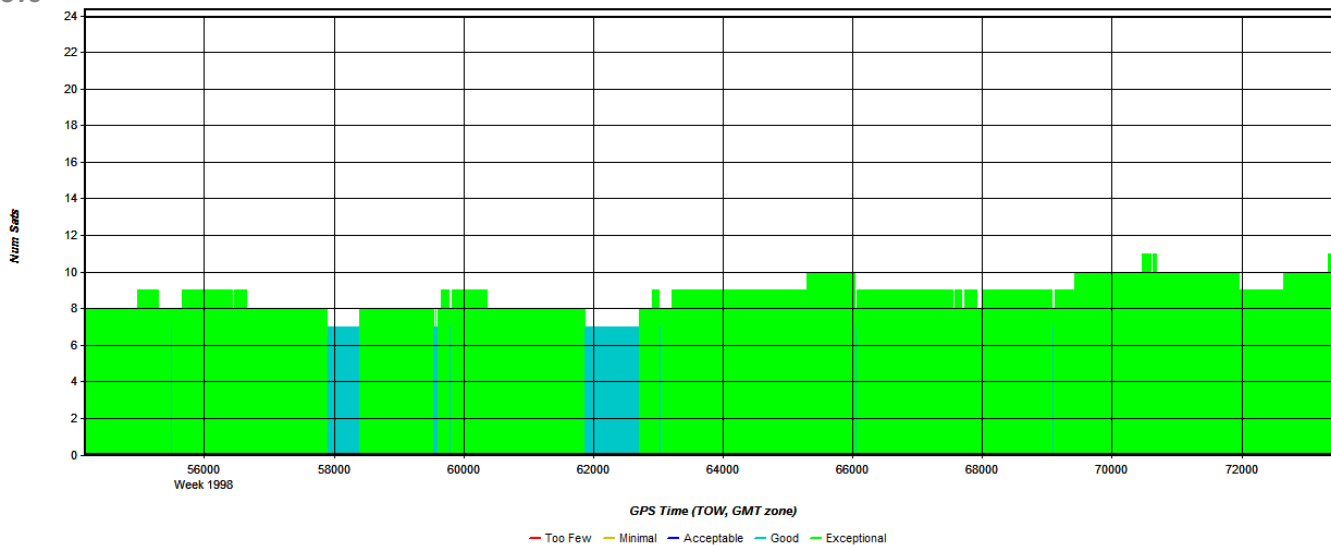




Combined RMS



SVs



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Acquisition and Processing details ----- (April 22, 2018)

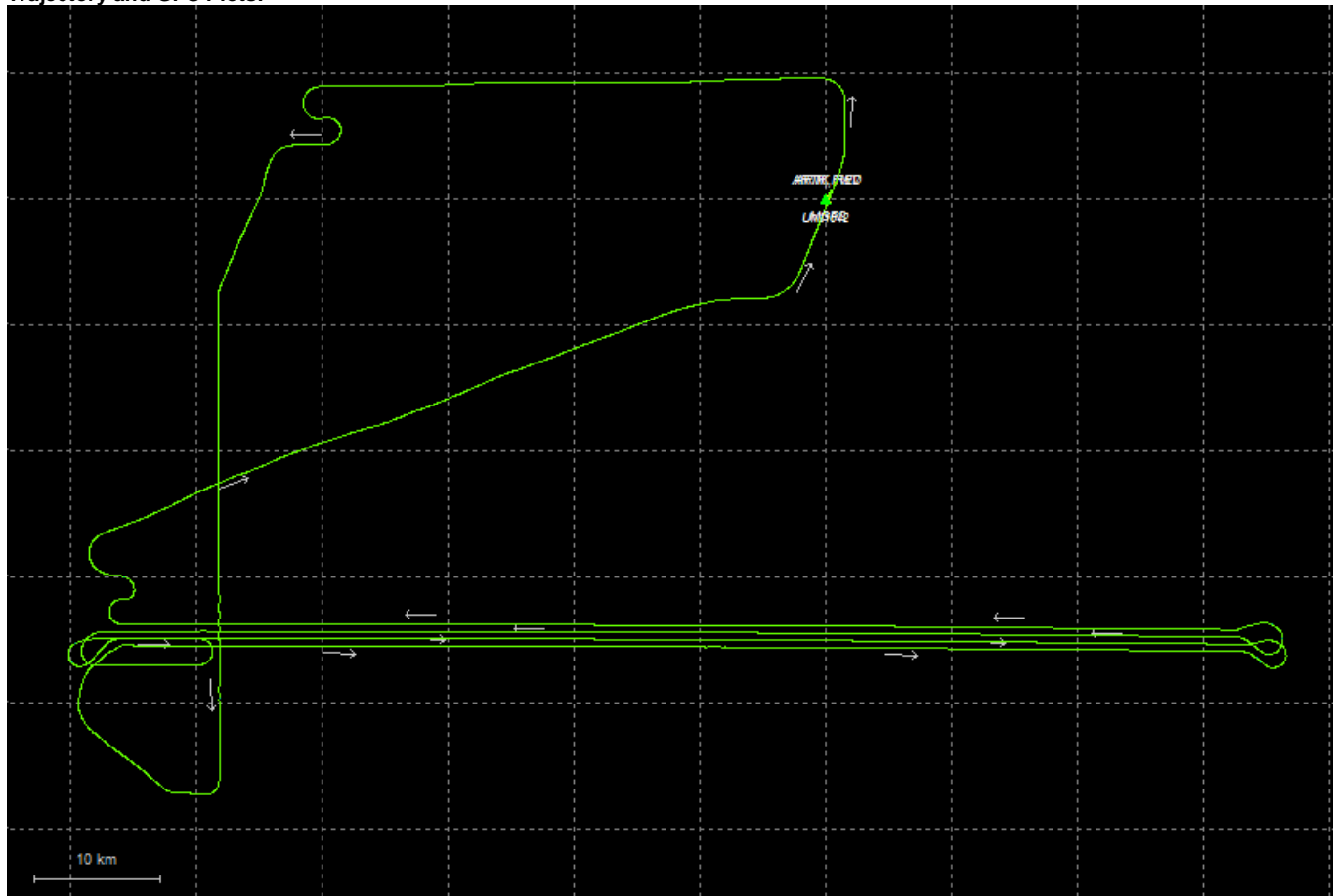
Log: 180422_165_33780055_02

18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KHSR	21:05	987.0	KHSR	0:29	990.0	3:24	3.50	3.0	0900-Production
2	KHSR	0:38	990.0	KRAP	1:06	990.3	0:28	0.50	0.3	0103-Mob/Demob
3										

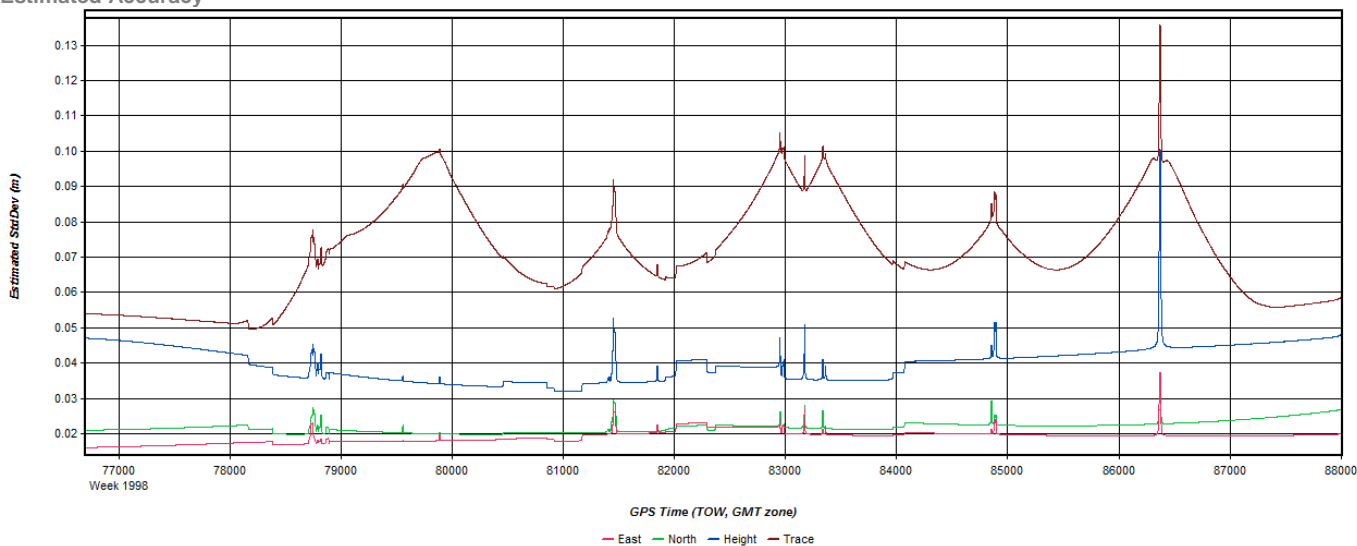
FUGRO		Fugro USA Land, Inc.		Riegl		Flight Log		AC80-50-00-02	
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FGI Job # 117019800	Project Name SD USGS FY18		System 680i	Unit 165	IMU				Ground Temp °C 20.0 20.0	Min Range' 1542	Data Logger Drives 12				
Flight Date 22-Apr-18	GPS Day 18-112	Lift 2		Sun°	Solar Times (UTC)	Pulse Rate 330			Flying Temp °C 10.0 10.0	Max Range' 2933	Download Drive				
Mission ID (yyymmdd_Sen_Job_Lift) 180422_165_117019800_02		Aircraft N97HC	Airport ID KRAP	FMS CCNS 8	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.13 30.11	Humidity @ Alt 46	Shipping Track	
Pilot #1 Randy Green		Pilot #2 Grant Cassell		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 0382	Location KHSR		Rec ID GR3-1	Ant ID GR3-1	ARP (m) 1.8	Start Time (UTC)	Stop Time (UTC)	GPS Filename Unit104220	Operator Riley Forsyth	Data					
Area	Flight #		Wpt		Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							21:20:00	21:25:00					ground static at KHSR	18	1.2
							21:51:29						s turn	19	1.0
W13X	1		72	1	31.2	0	21:58:06	22:06:55	S	6,047	117		cross tie line	19	1.0
W13F	43		1	195	0	85.4	22:12:49	22:35:56	E	6,344	127			20	0.9
	42		196	1	85.8	0	22:38:17	23:01:01	W	5,644	130			18	1.0
	42		1	10	0	4	23:03:53	23:05:30	E	6,408	115		Calibration line	16	1.1
	41		1	195	0	85.4	23:10:03	23:33:11	E	6,368	115			16	1.1
	40		195	1	85.4	0	23:35:24	23:57:49	W	5,578	126			16	1.2
							23:58:13						s turn	16	1.1
							0:21:00	0:26:00					ground static at KHSR	16	1.2

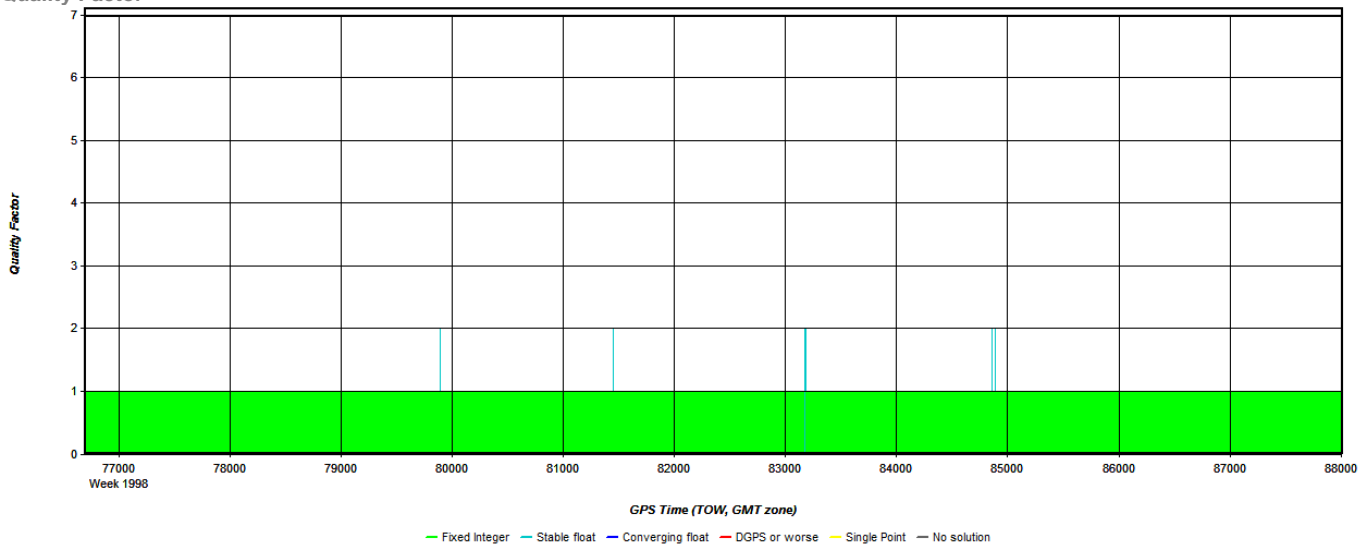
Trajectory and GPS Plots:



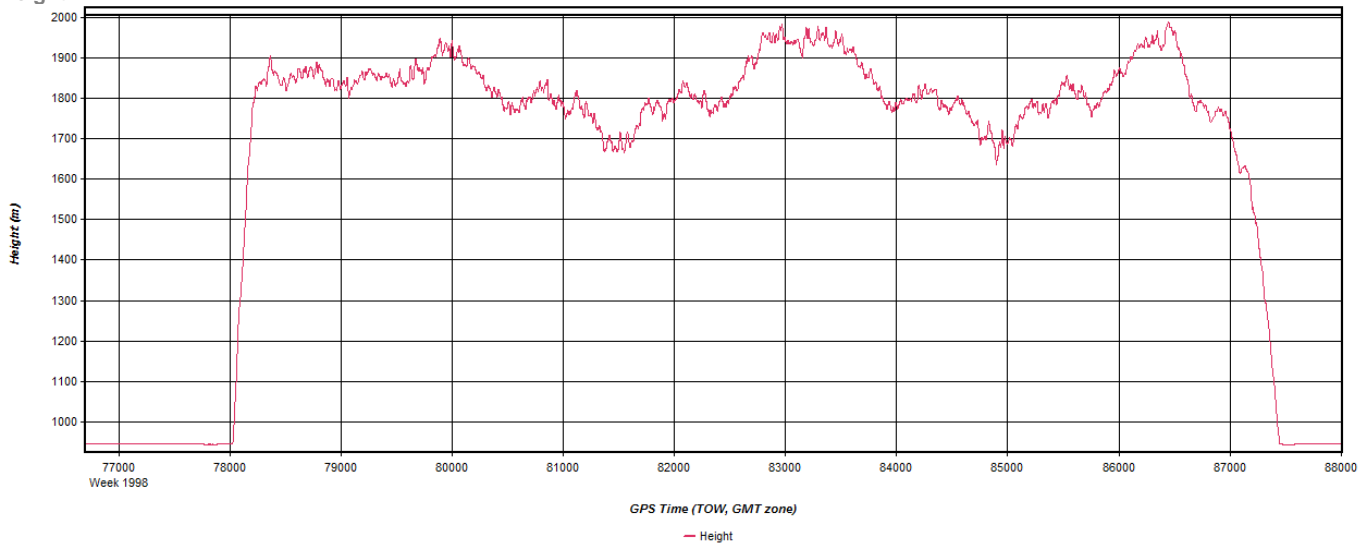
Estimated Accuracy



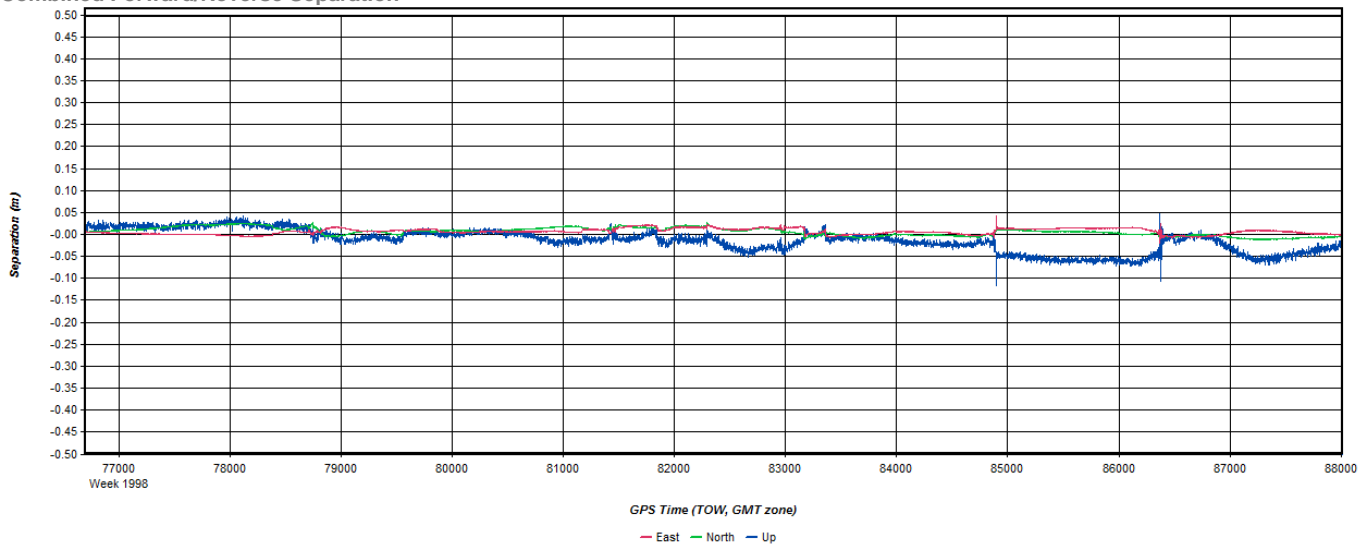
Quality Factor



Height



Combined Forward/Reverse Separation

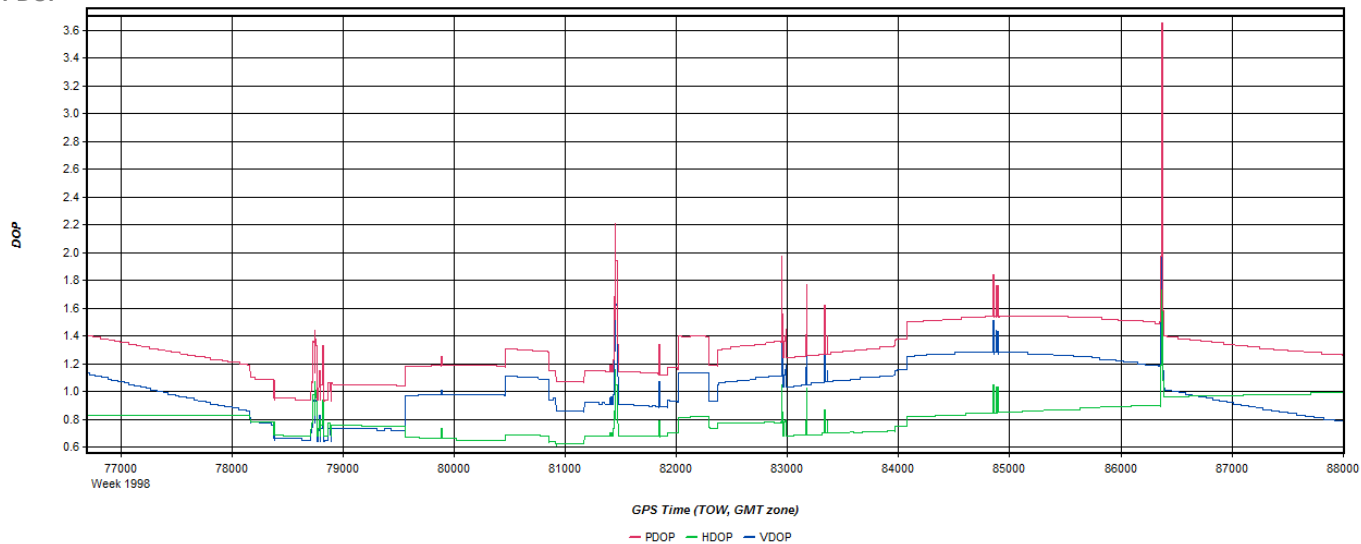


Combined Forward/Reverse Weighting

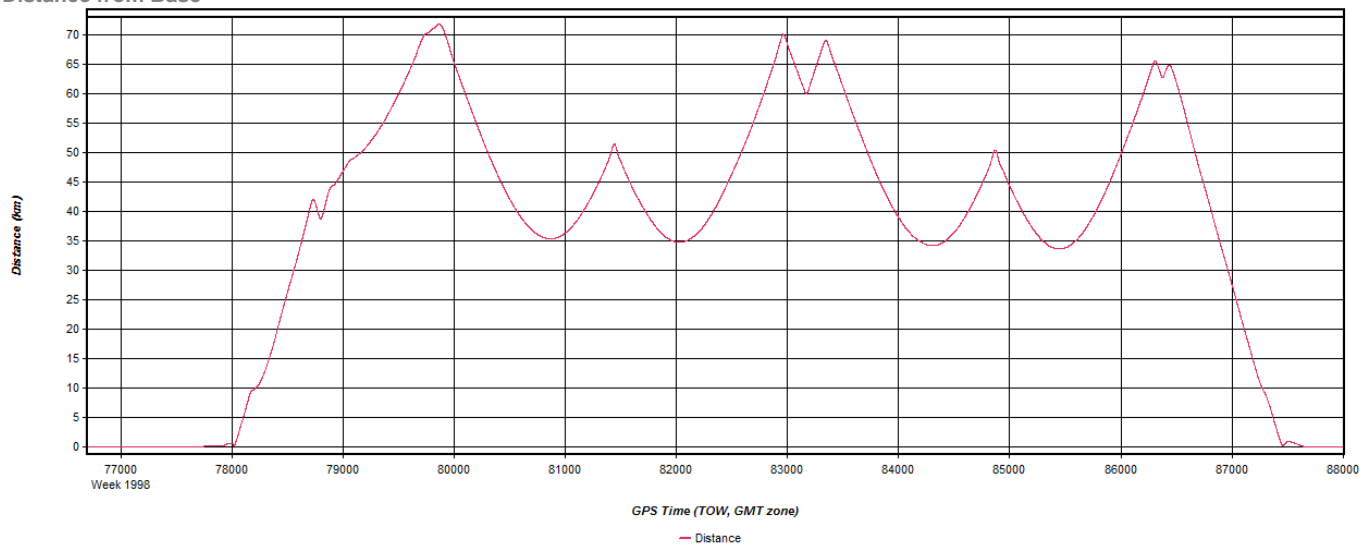




PDOP

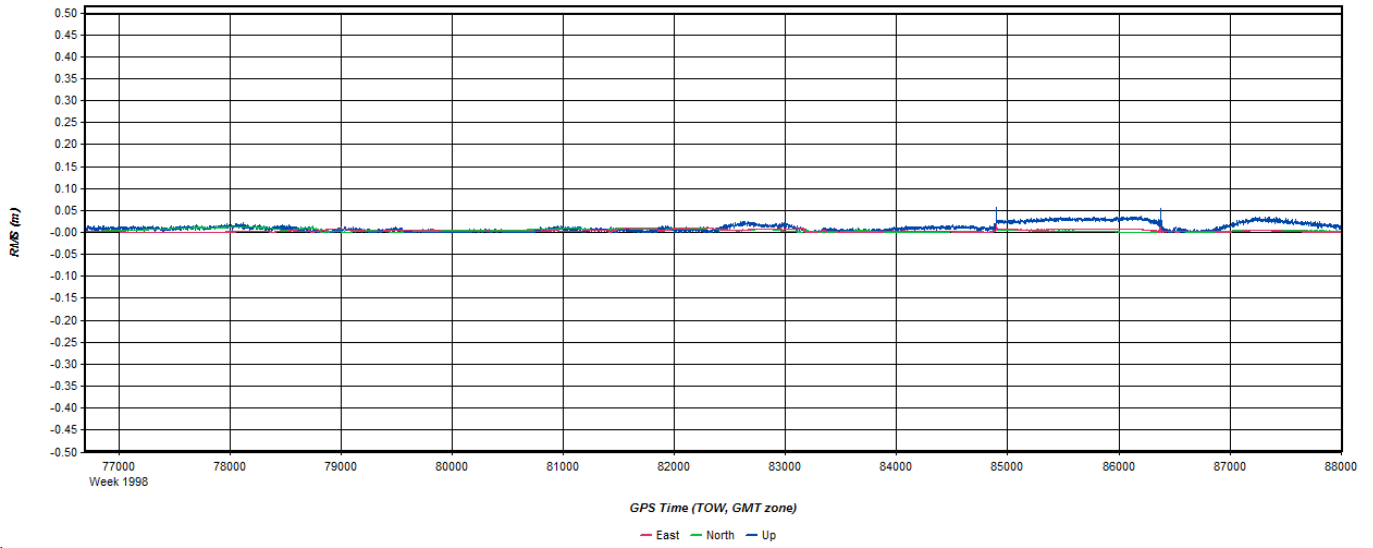


Distance from Base

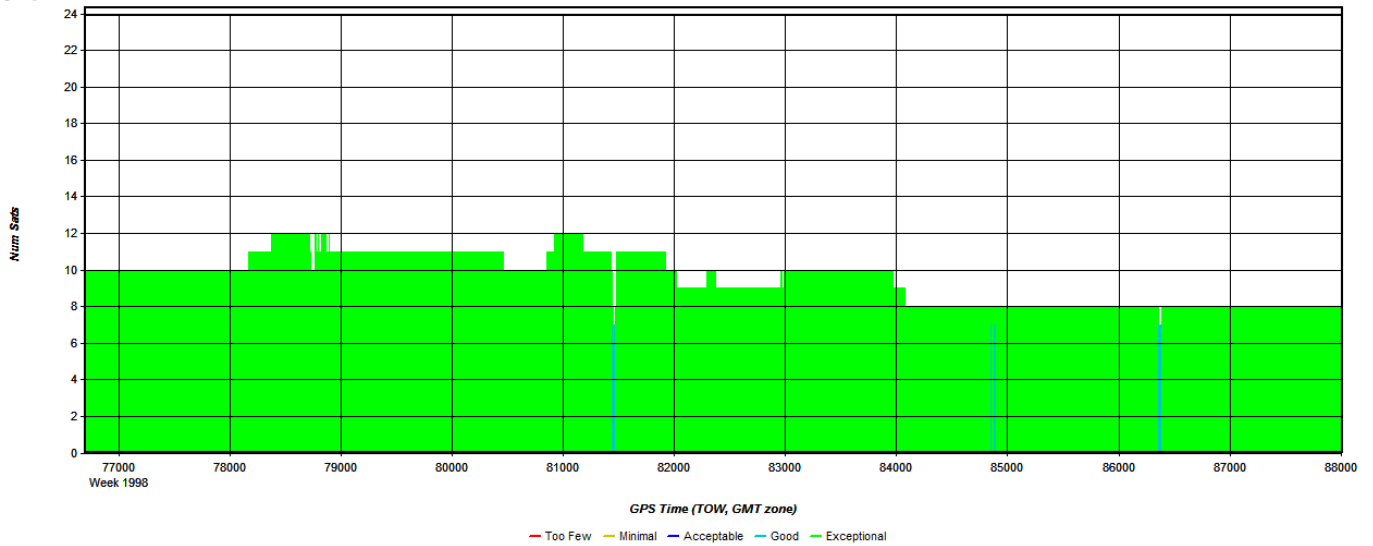


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Combined RMS



SVs



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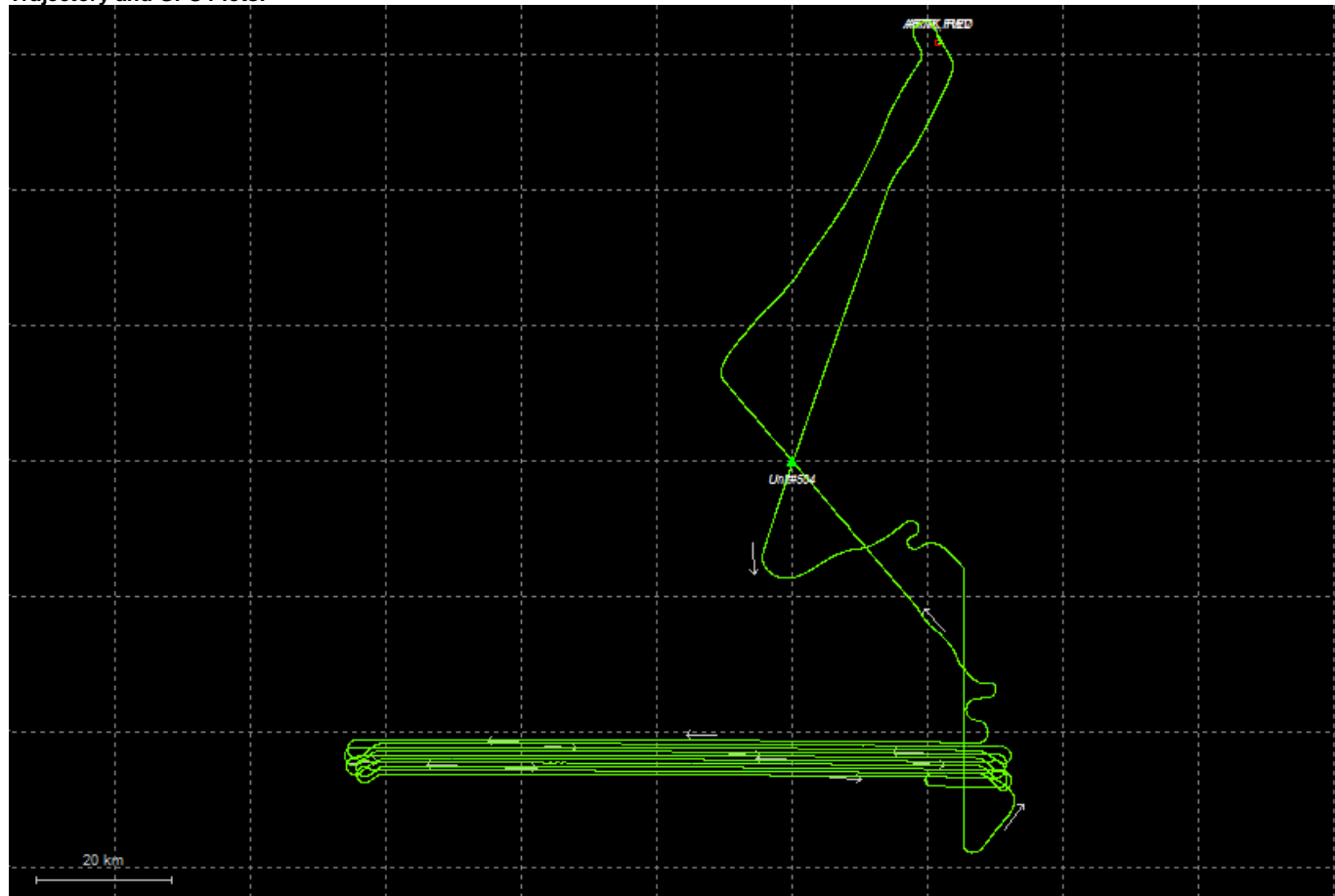
Acquisition and Processing details ----- (April 23, 2018)

Log: 180423_165_33780055_03

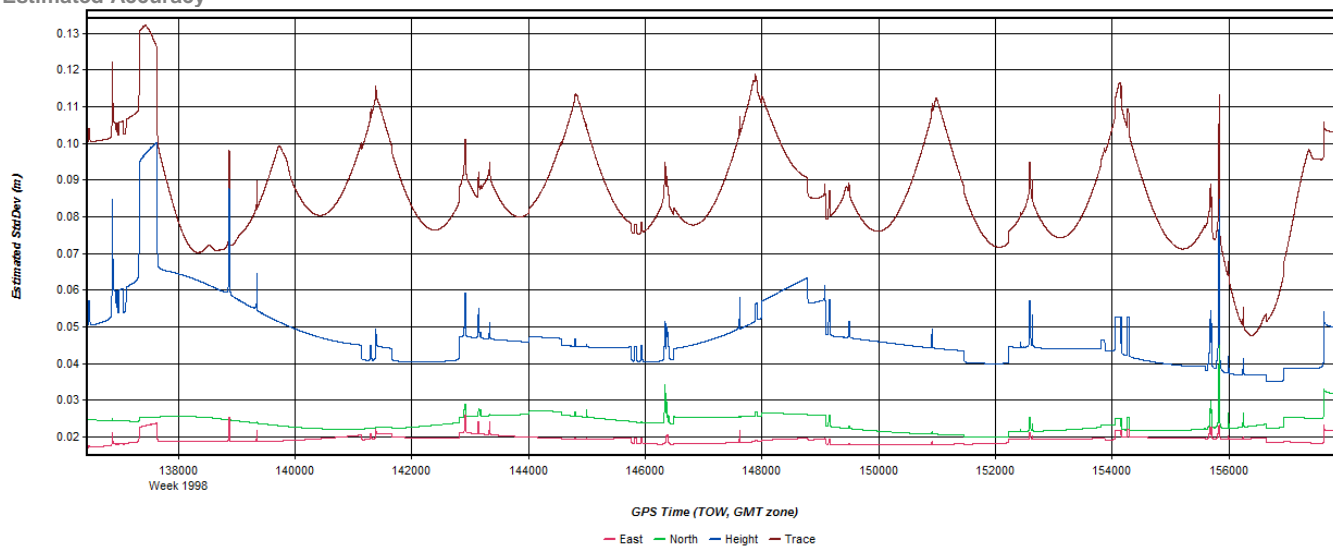
FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02		
18.01														
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity					
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs						
1	KRAP	13:49	990.3	KRAP	19:53	995.9	6:04	6:00	5:6	0900-Production				
2														
3														

FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU				Ground Temp °C 8.0 18.0	Min Range' 1542	Data Logger Drives 20/16				
Flight Date 23-Apr-18	GPS Day 18-113	Lift 3	Sun°		Solar Times (UTC)	Pulse Rate 330			Flying Temp °C 8.0 10.0	Max Range' 2933	Download Drive				
Mission ID (yyymmdd_Sen_Job_Lift) 180423_165_33780055_03	Aircraft N97HC	Airport ID KRAP	FMS CCNS 8	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.09 30.03	Humidity @ Alt 81	Shipping Track		
Pilot #1 Randy Green		Pilot #2 Grant Cassell		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-1	Ant ID GR3-1	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50423	Operator Rob Nelson	Data			
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate			
							13:57:00	14:02:00					ground static at KRAP	16	1.3
							14:22:16	14:27:19					overfly basestation	16	1.6
							14:32:47						s turn	16	1.3
W13X	2		67	1	29	0	14:39:21	14:47:41	S	5,435	119		cross tie line	16	1.2
W13F	39		195	1	85.4	0	14:52:27	15:14:51	W	5,503	129			16	1.2
	38		1	195	0	85.4	15:17:26	15:40:06	E	6,434	119			17	1.1
	38		195	185	85.4	81	15:43:10	15:44:43	W	5,622	130		Calibration line	17	1.1
	37		195	1	85.4	0	15:49:52	16:12:09	W	5,615	130			17	1.1
	36		1	195	0	85.4	16:14:48	16:37:30	E	6,380	124			15	1.3
	35		195	1	85.4	0	16:40:03	17:02:28	W	5,565	126			16	1.2
	34		1	195	0	85.4	17:05:56	17:29:14	E	6,280	120			17	1.2
	33		195	1	85.4	0	17:31:59	17:54:33	W	5,993	125			16	1.2
	32		1	195	0	85.4	17:58:12	18:21:27	E	6,427	118			18	1.2
	31		195	1	85.4	0	18:24:25	18:46:54	W	5,686	127			18	1.1
	30		1	195	0	85.4	18:50:17	19:13:34	E	6,344	121			20	1.0
							19:13:40						s turn	17	1.1
							19:24:03	19:29:04					overfly basestation	19	1.1
							19:47:00	19:52:00					ground static at KRAP	16	1.4

Trajectory and GPS Plots:

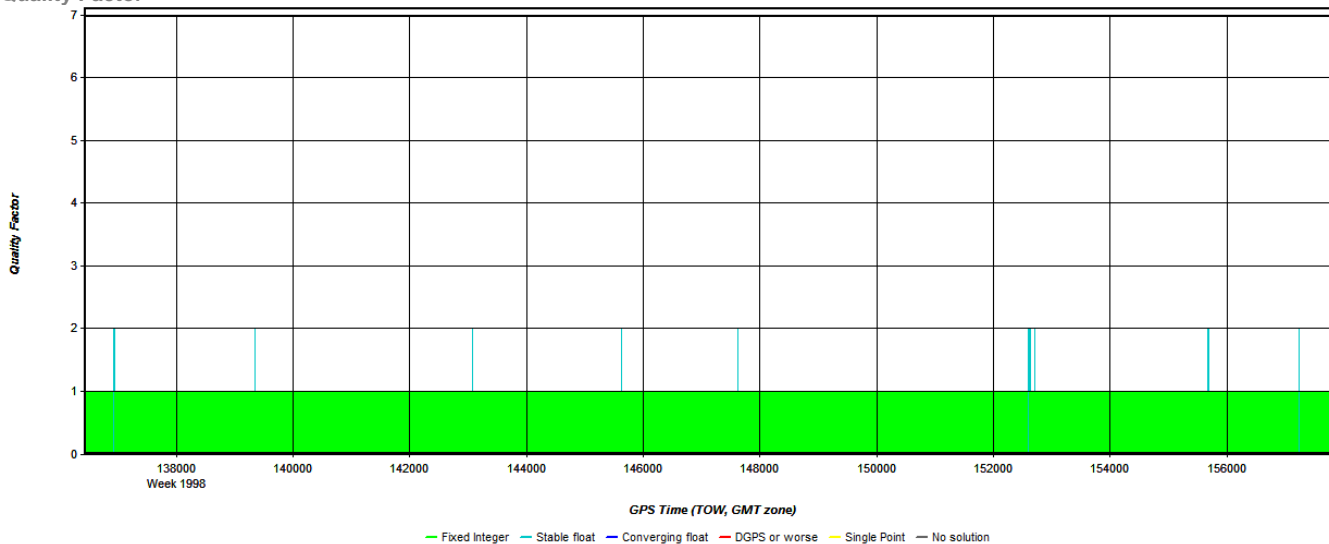


Estimated Accuracy

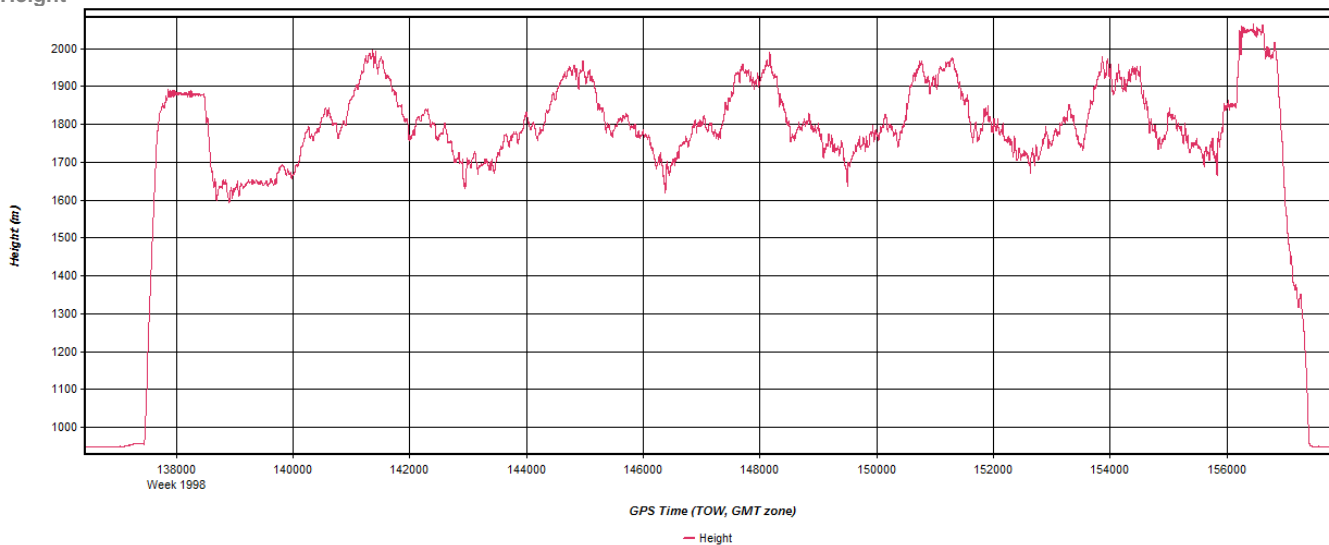




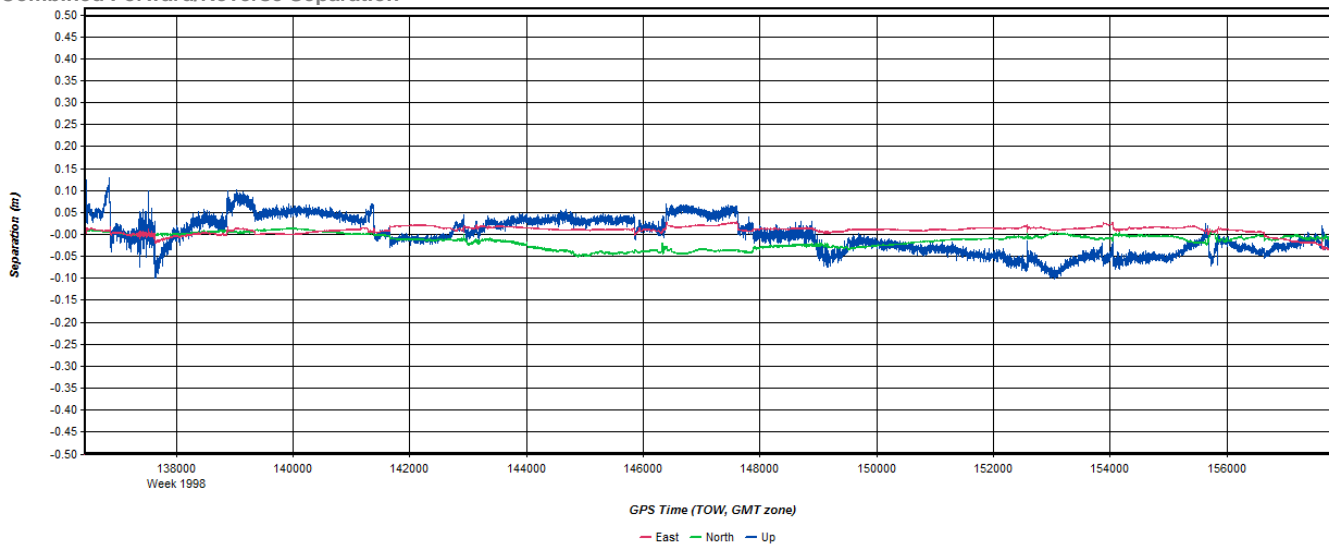
Quality Factor



Height



Combined Forward/Reverse Separation

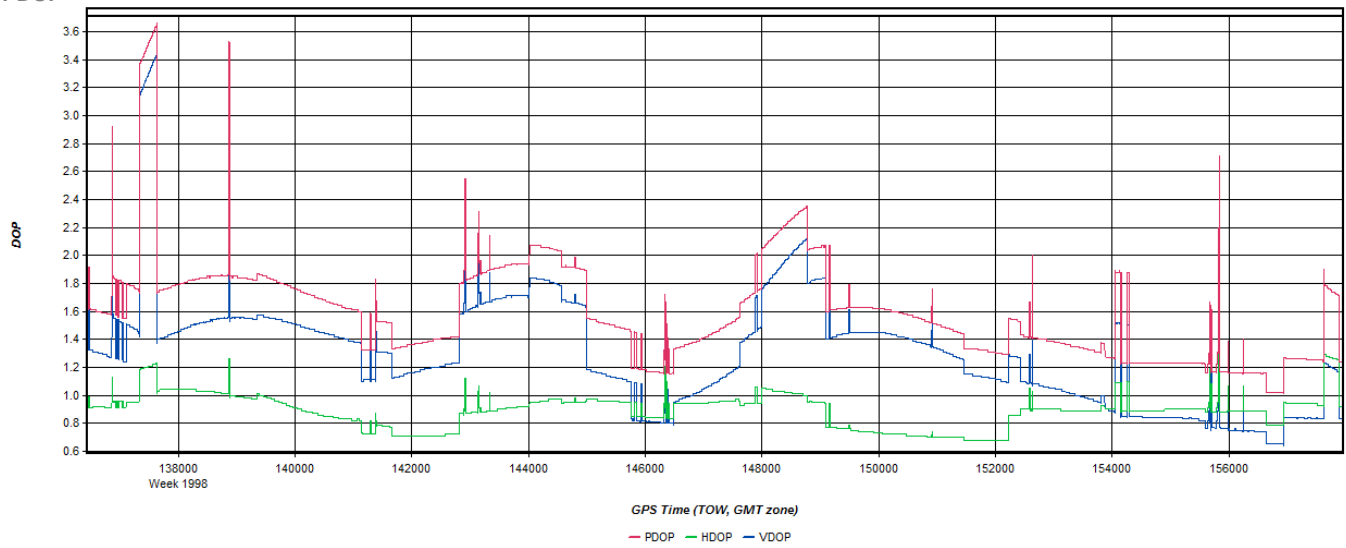


Combined Forward/Reverse Weighting

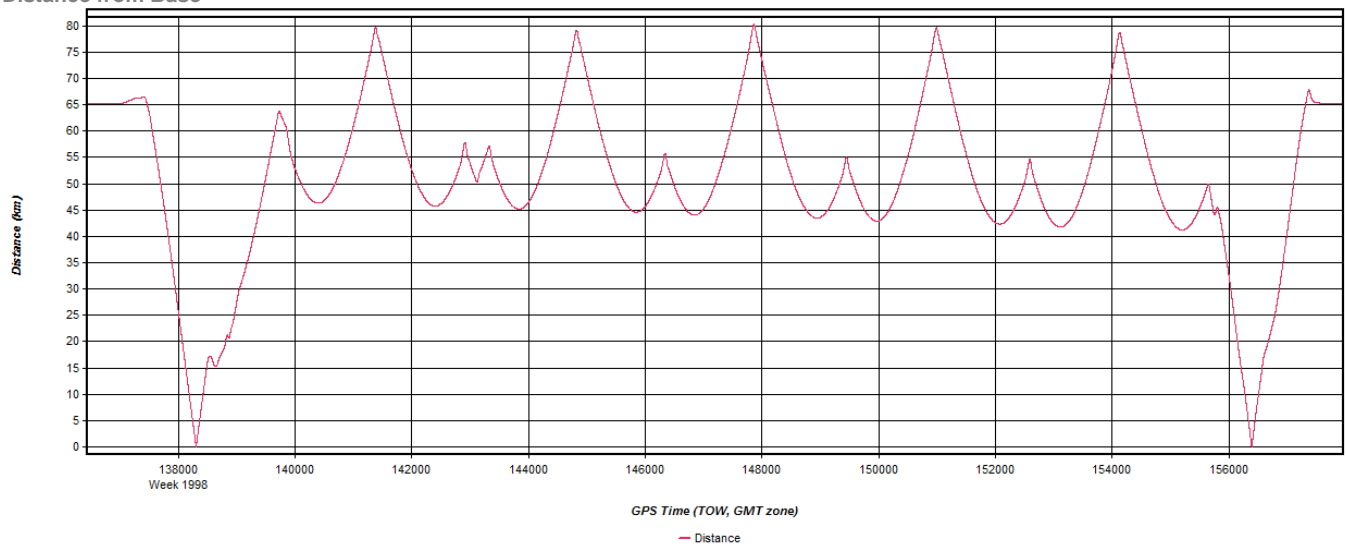


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PDOP

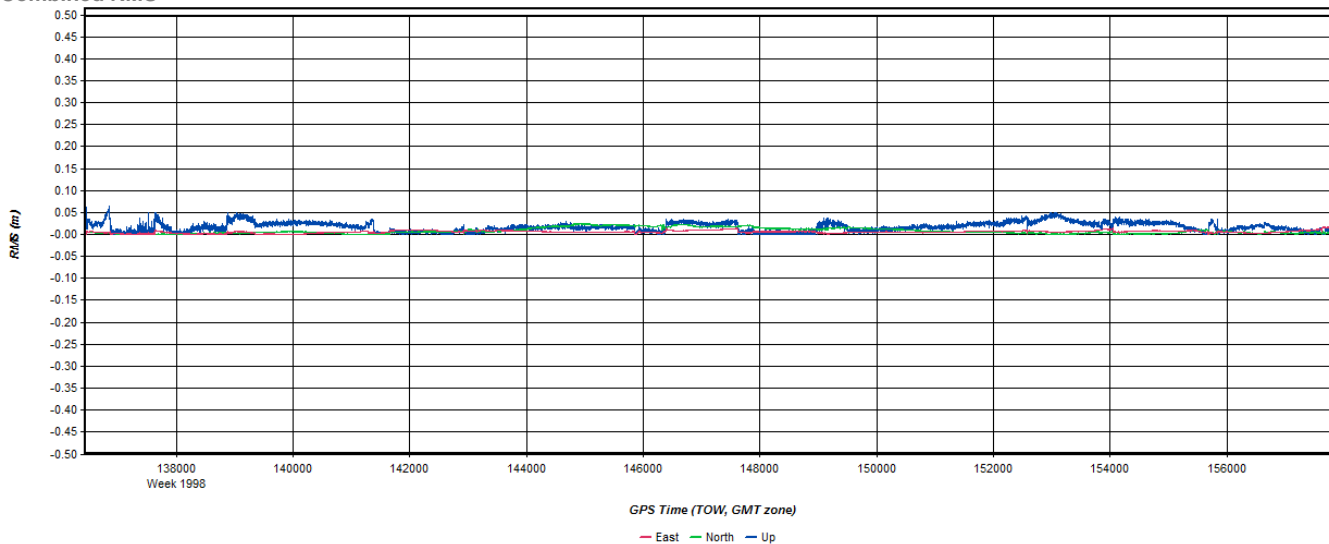


Distance from Base

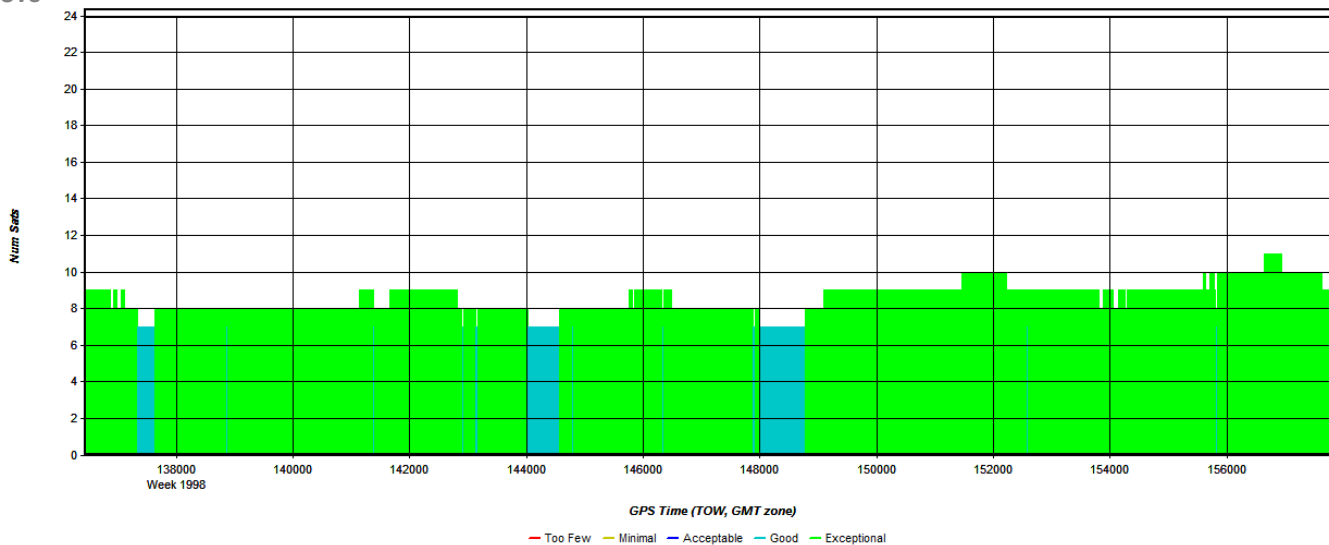




Combined RMS



SVs



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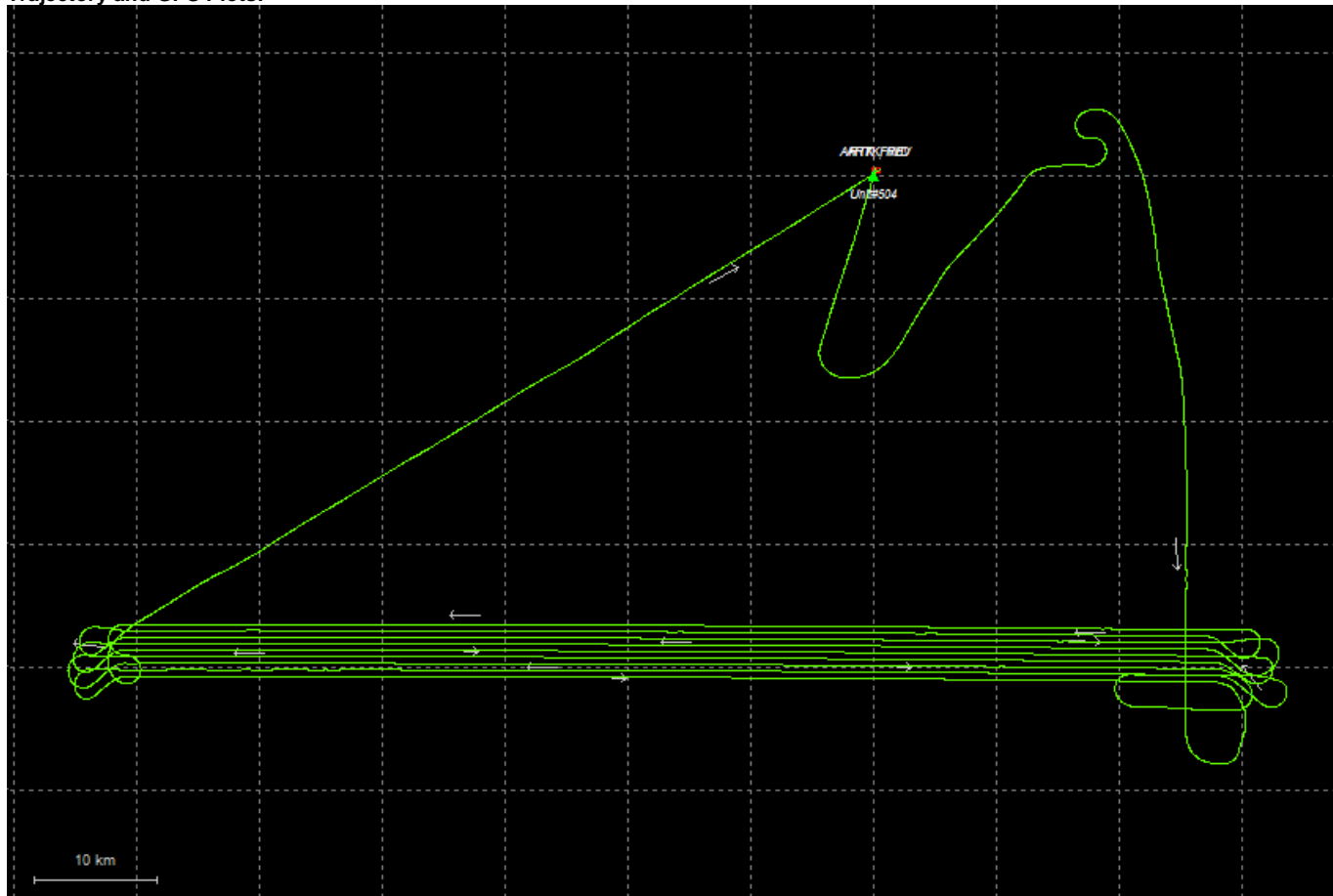


Acquisition and Processing details ----- (April 25, 2018)

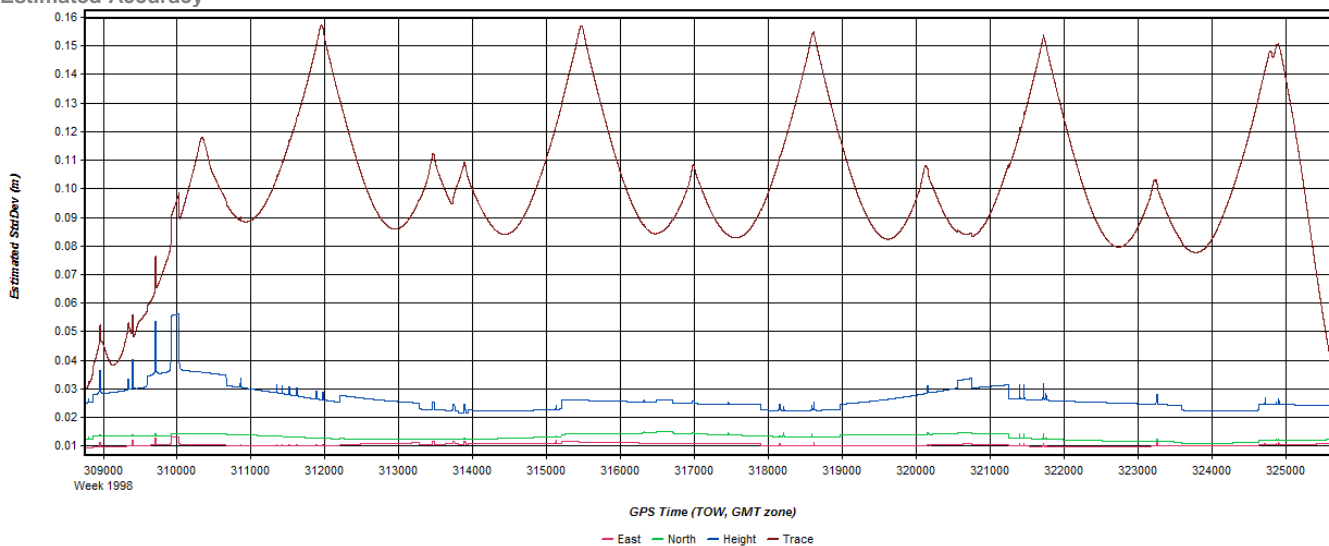
Log: 180425_165_33780055_04

FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02				
18.01																
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity							
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs								
1	KRAP	13:04	996.7	KRAP	18:54	1001.9	5:50	5:75	5:2	0900-Production						
2																
3																
FGI Job # 33780055		Project Name SD USGS FY18			System 680i	Unit 165	IMU				Ground Temp °C 1.0 21.0		Min Range' 1542	Data Logger Drives 14		
Flight Date 24-Apr-18		GPS Day 18-114	Lift 4			Sun*	Solar Times (UTC)		Pulse Rate 330	Flying Temp °C 6.0 7.0		Max Range' 2933	Down load Drive			
Mission ID (ymmdd_Sen_Job_Lift) 180424_165_33780055_04				Aircraft N97HC	Airport ID KRAP	FMS CCNS 8	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.25 30.04	Humidity @ Alt 80	Shipping Track
Pilot #1 Randy Green		Pilot #2 Grant Cassell		Operator #1 Riley Forsyth		Operator #2										
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50424x		Operator Rob Nelson		Data		
Area	Flight #	Client	Wpt	Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions			SVs	PDOP
				From	To	Begin	End					Start	End			
						13:12:00	13:17:00					ground static at KRAP			16	1.3
						13:43:00	13:48:18					overfly basestation			15	1.3
						13:54:46						s turn			16	1.1
W13X	2		60 25	26	10.6	14:06:06	14:10:37	S	5,421	123		cross tie line			17	1.0
W13F	29		195 1	85.4	0	14:14:06	14:37:32	W	5,452	115					16	1.1
	28		1 195	0	85.4	14:40:10	15:02:21	E	6,129	128					15	1.3
	28		195 185	85.4	81	15:06:10	15:07:54	W	5,708	119		calibration line			17	1.1
	27		195 1	85.4	0	15:12:32	15:35:54	W	5,452	111					17	1.1
	26		1 195	0	85.4	15:38:55	16:01:26	E	6,245	130					16	1.1
	25		194 1	84.9	0	16:04:44	16:28:20	W	5,559	120					15	1.2
	24		1 194	0	84.9	16:31:07	16:53:34	E	6,138	124					17	1.1
	23		194 1	84.9	0	16:57:08	17:20:28	W	5,487	118					17	1.3
	22		1 194	0	84.9	17:22:58	17:45:30	E	6,207	129					17	1.2
	21		194 1	84.9	0	17:48:19	18:11:59	W	5,541	117					18	1.2
						18:12:09						s turn			19	1.1
						18:26:17	18:31:17					overfly basestation			18	1.1
						18:48:00	18:53:00					ground static at KRAP			16	1.3

Trajectory and GPS Plots:

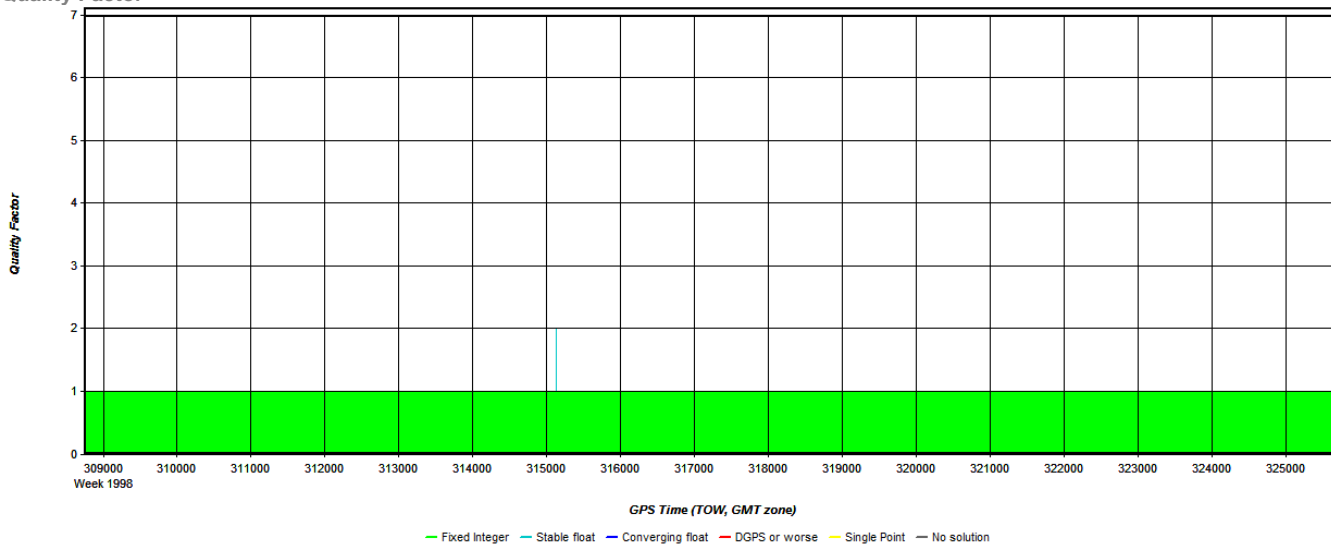


Estimated Accuracy

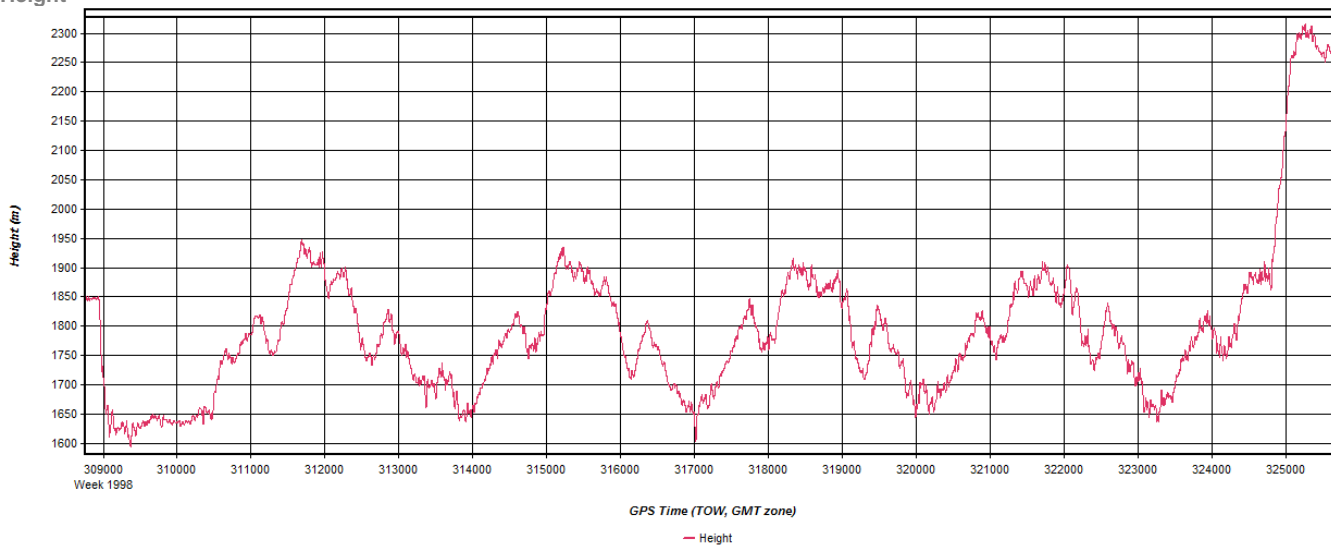




Quality Factor

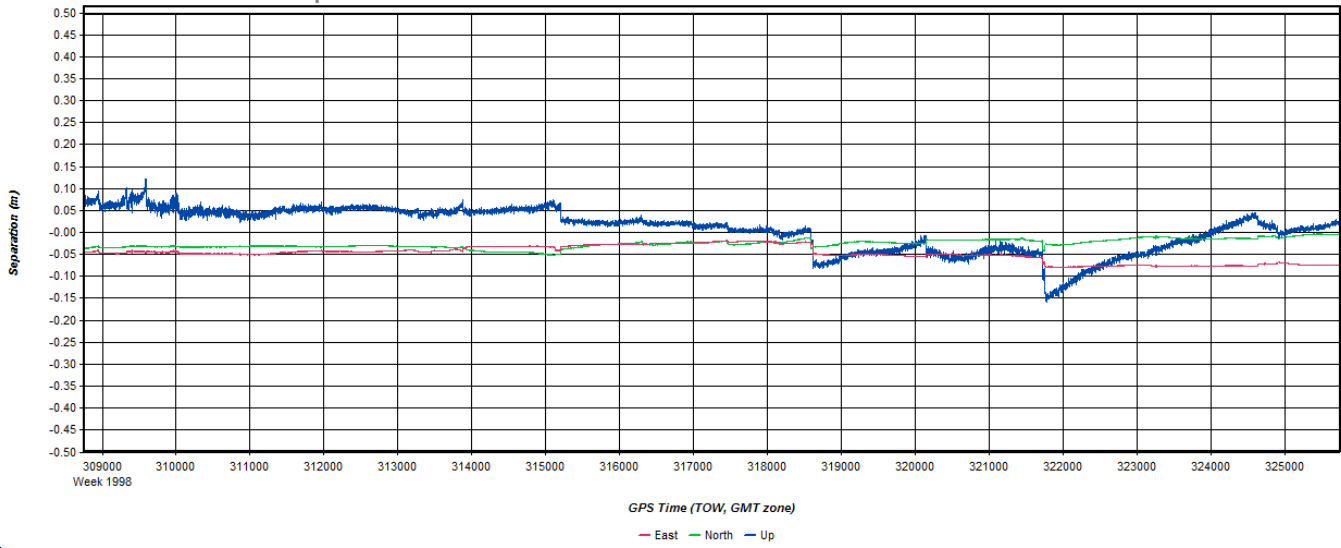


Height



**USGS
COLLECTION REPORT**

Combined Forward/Reverse Separation

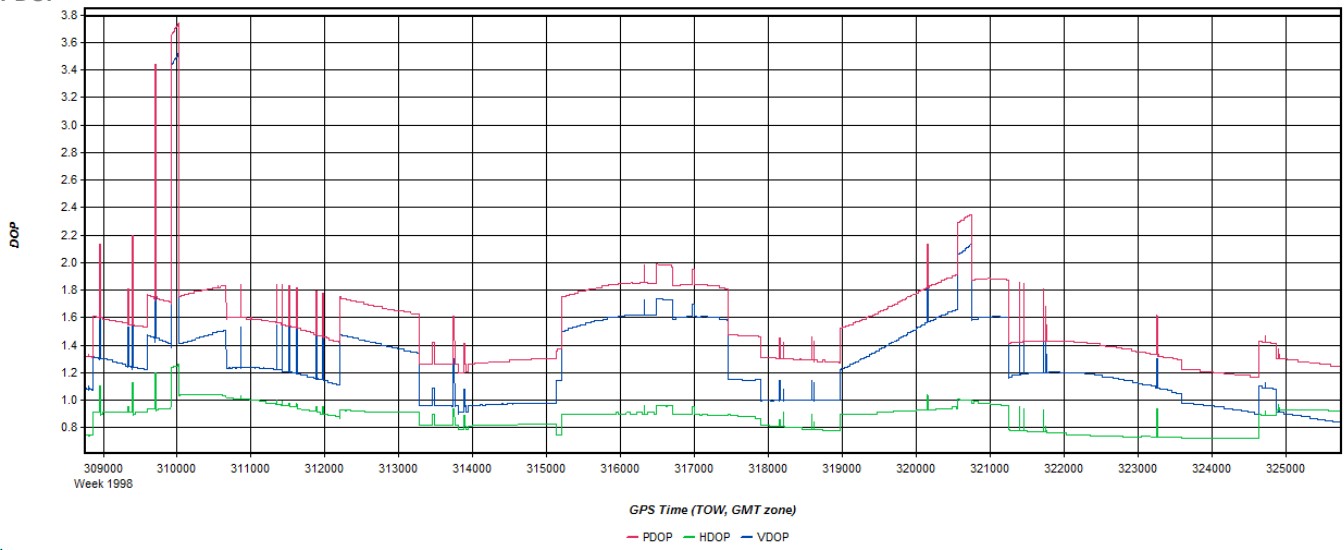


Combined Forward/Reverse Weighting

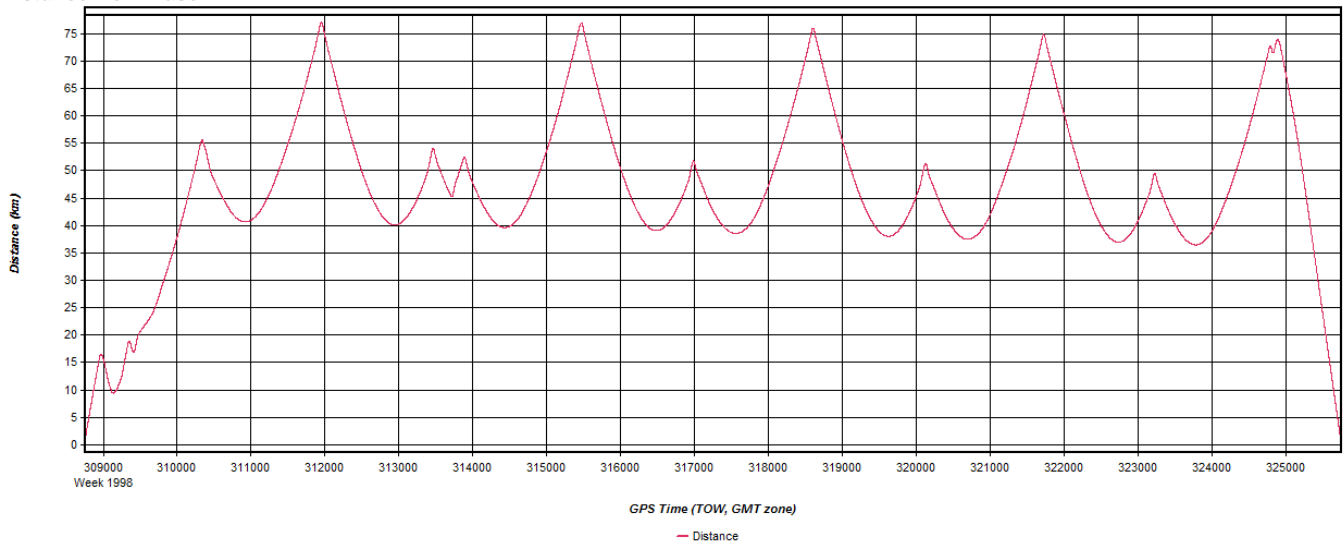


**USGS
COLLECTION REPORT**

PDOP

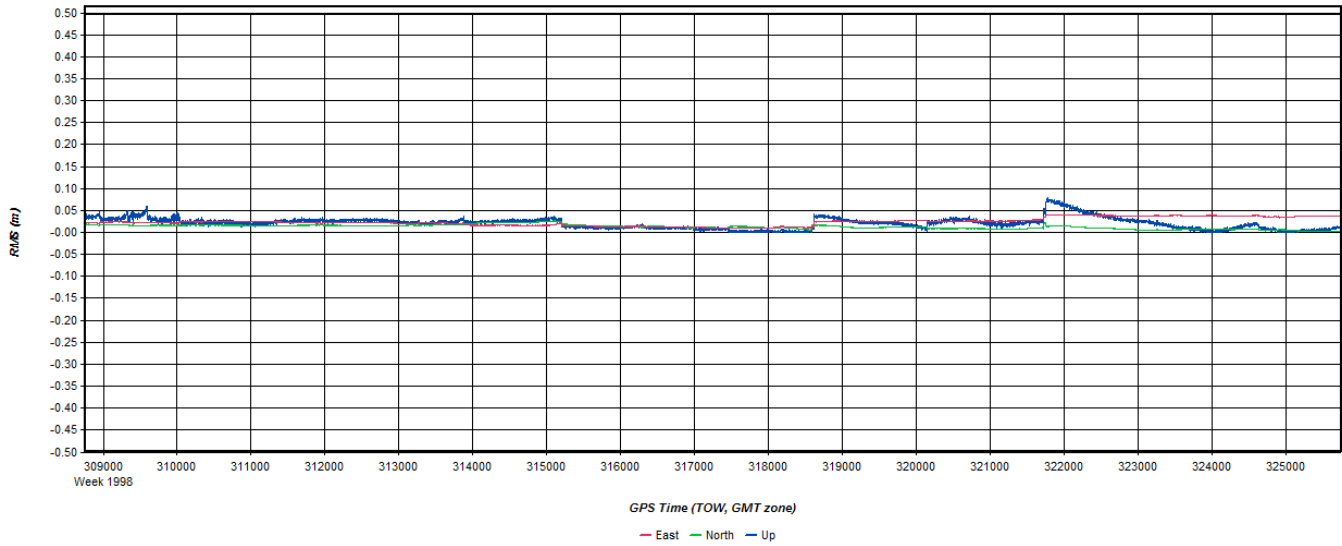


Distance from Base

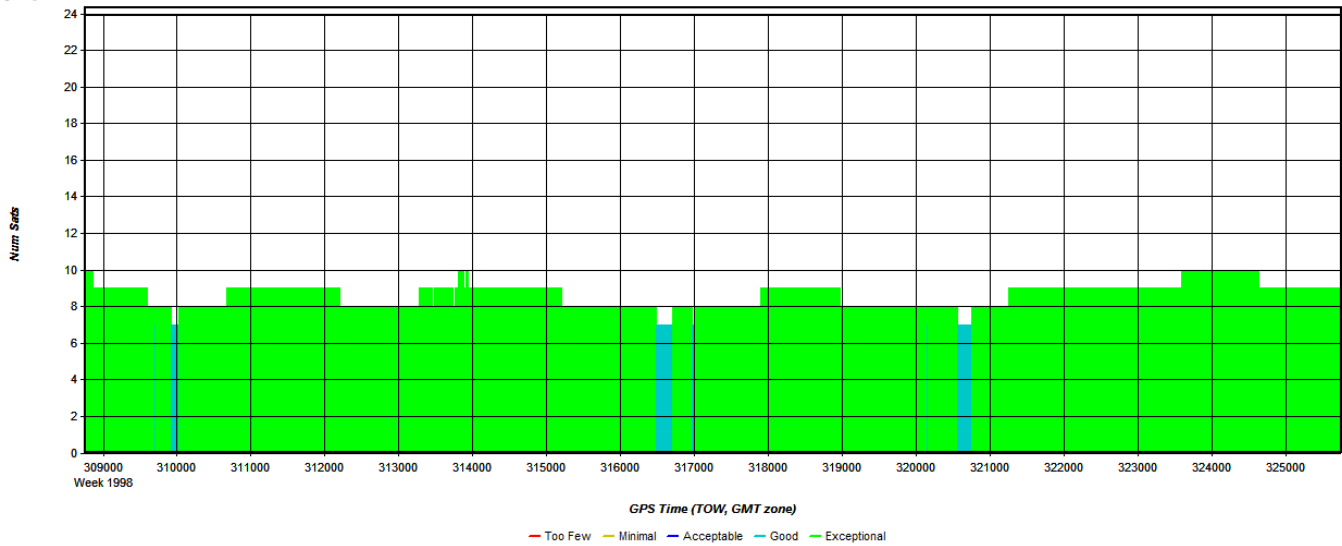


**USGS
COLLECTION REPORT**

Combined RMS



SVs





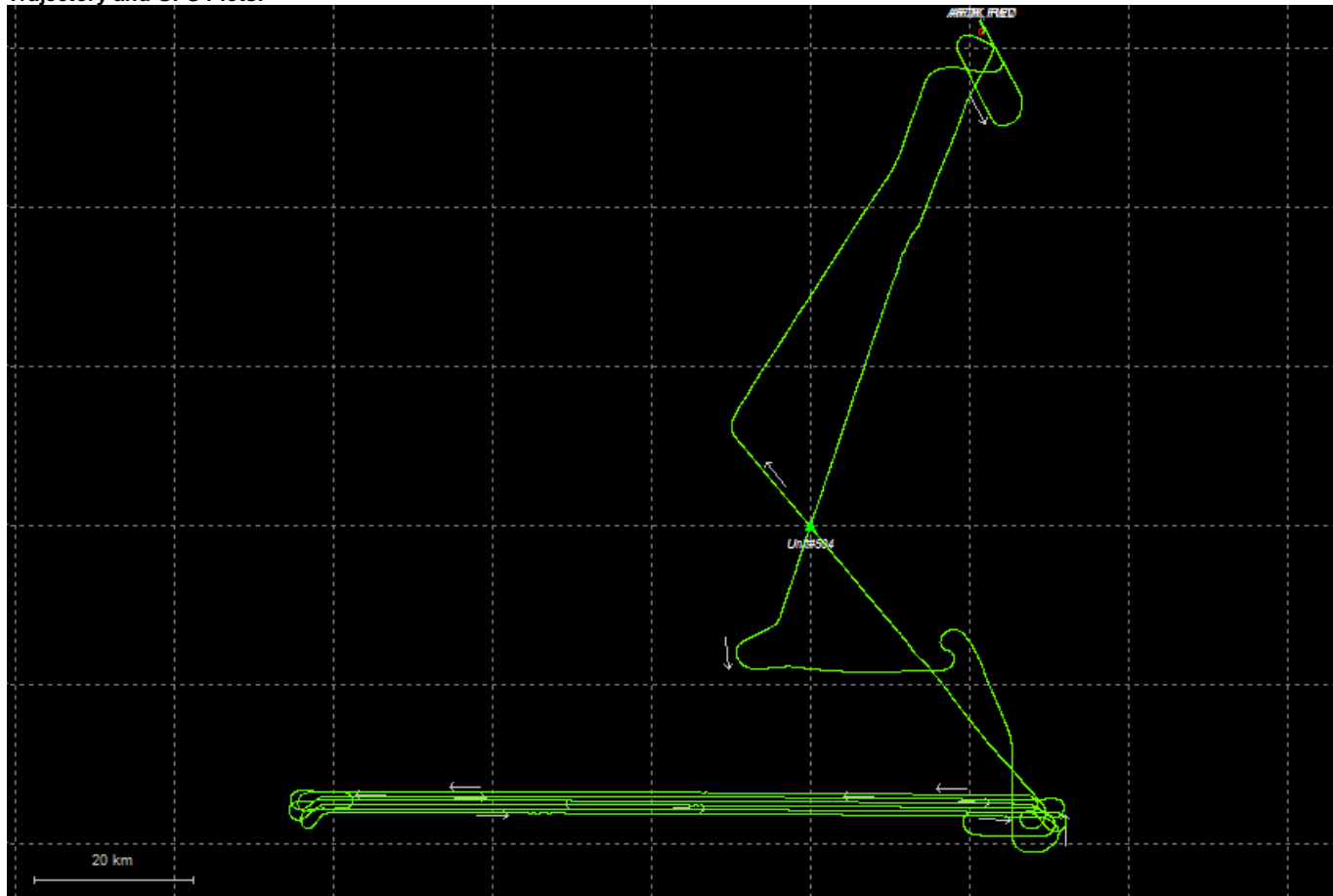
Acquisition and Processing details ----- (April 25, 2018)

Log: 180425_165_33780055_05

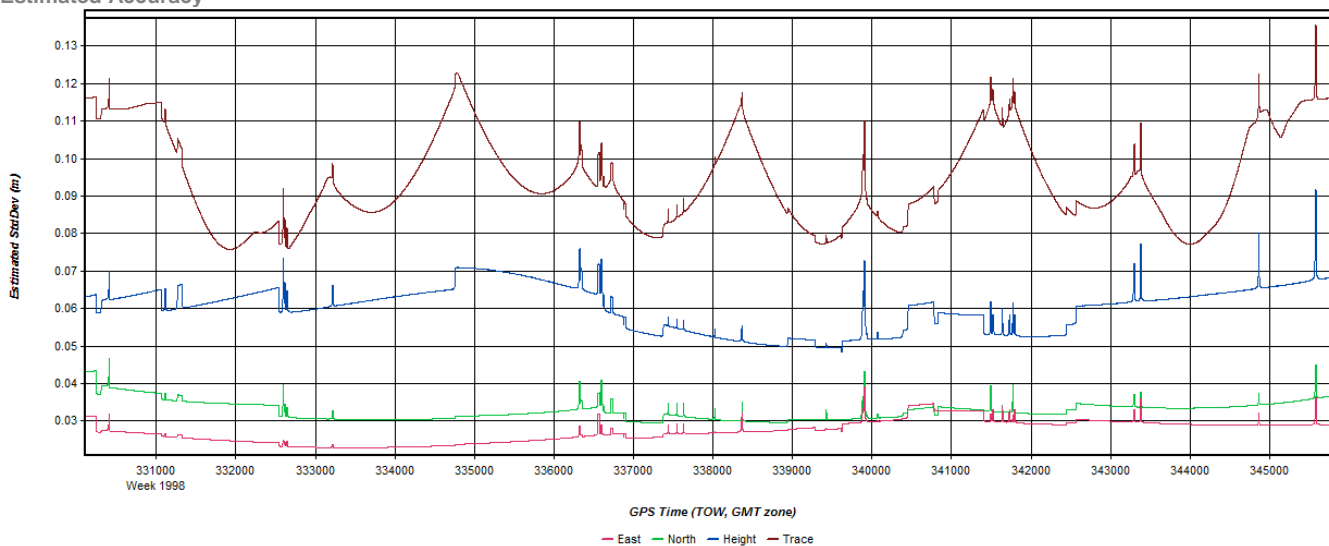
18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	19:36	1001.9	KRAP	0:06	1005.9	4:30	4.50	4.0	0900-Production
2										
3										

Fugro USA Land, Inc.		Riegl Flight Log AC80-50-00-02													
FGI Job # 33780055	Project Name SD USGS FY18			System 680i	Unit 165	IMU				Ground Temp °C 20.0 23.0	Min Range' 1542	Data Logger Drives 18			
Flight Date 24-Apr-18	GPS Day 18-114	Lift 5			Sun°	Solar Times (UTC)		Pulse Rate 330	Flying Temp °C 15.0 8.0		Max Range' 2933	Download Drive			
Mission ID (yyymmdd_Sen_Job_Lift) 180424_165_33780055_05		Aircraft N97HC	Airport ID KRAP	FMS CCNS 8	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.02 29.86	Humidity @ Alt 13	Shipping Track	
Pilot #1 Randy Green		Pilot #2 Grant Cassell		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50424x	Operator Rob Nelson	Data			
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							19:43:00	19:48:00					ground static at KRAP	17	1.3
							20:09:43	20:14:43					overfly basestation	20	1.0
							20:22:14						s turn	19	1.2
W13X	2		55	40	23.8	17.2	20:28:29	20:31:02	S	5,612	123		cross tie line	19	1.2
W13F	20		194	1	84.9	0	20:34:20	20:58:00	W	5,556	121			18	1.2
	19		1	194	0	84.9	21:00:35	21:23:23	E	6,109	125			19	1.2
	19		194	184	84.9	80.5	21:26:49	21:28:28	W	5,605	123		calibration line	18	1.0
	18		194	1	84.9	0	21:33:13	21:57:08	W	5,518	117			18	1.1
	17		1	194	0	84.9	22:00:13	22:22:59	E	6,285	121			19	1.0
	16		194	1	84.9	0	22:26:05	22:49:59	W	5,440	115			18	1.0
	15		1	194	0	84.9	22:56:58	23:19:49	E	6,386	127			17	1.1
							23:19:57						s turn	16	1.2
							23:30:43	23:36:00					overfly basestation	15	1.2
							1:00:00	0:05:00					ground static at KRAP	14	1.3

Trajectory and GPS Plots:

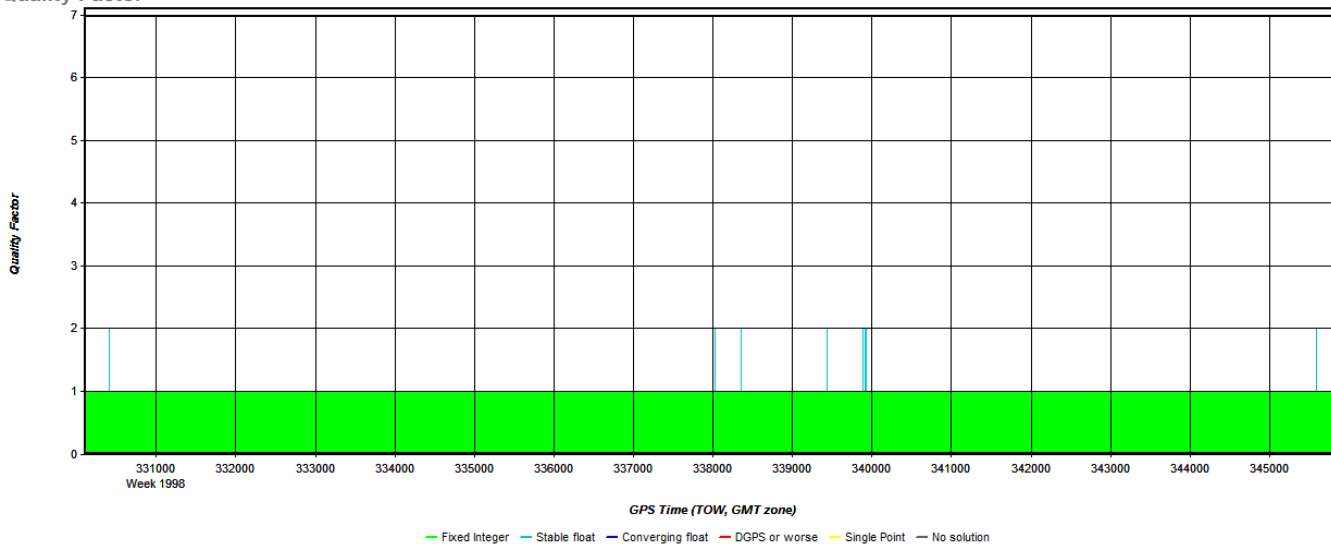


Estimated Accuracy

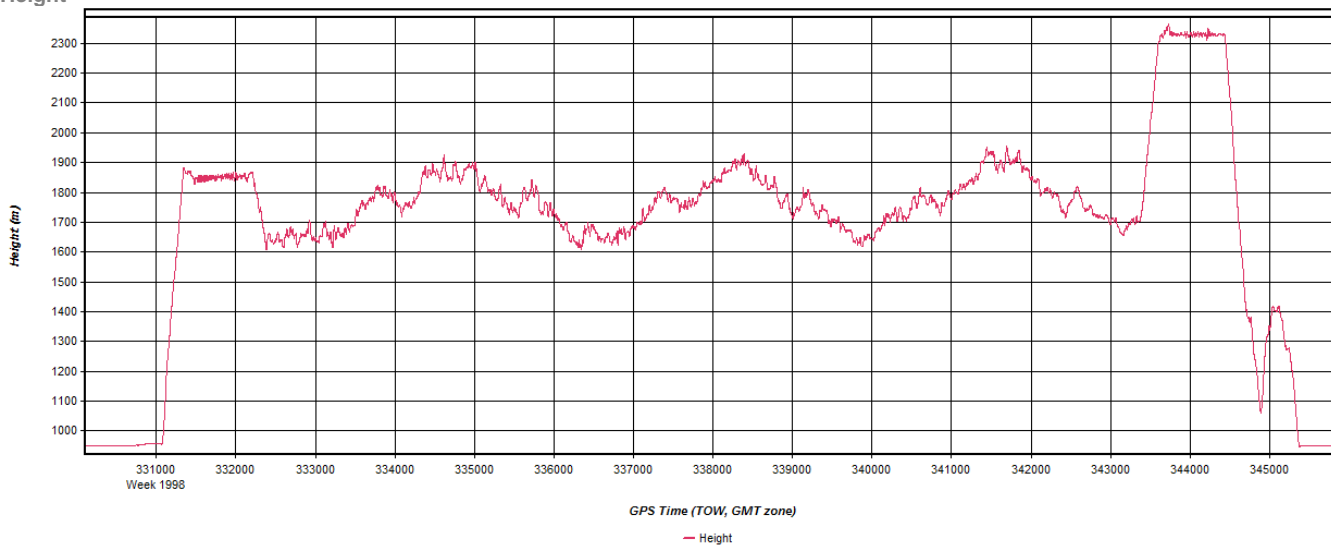




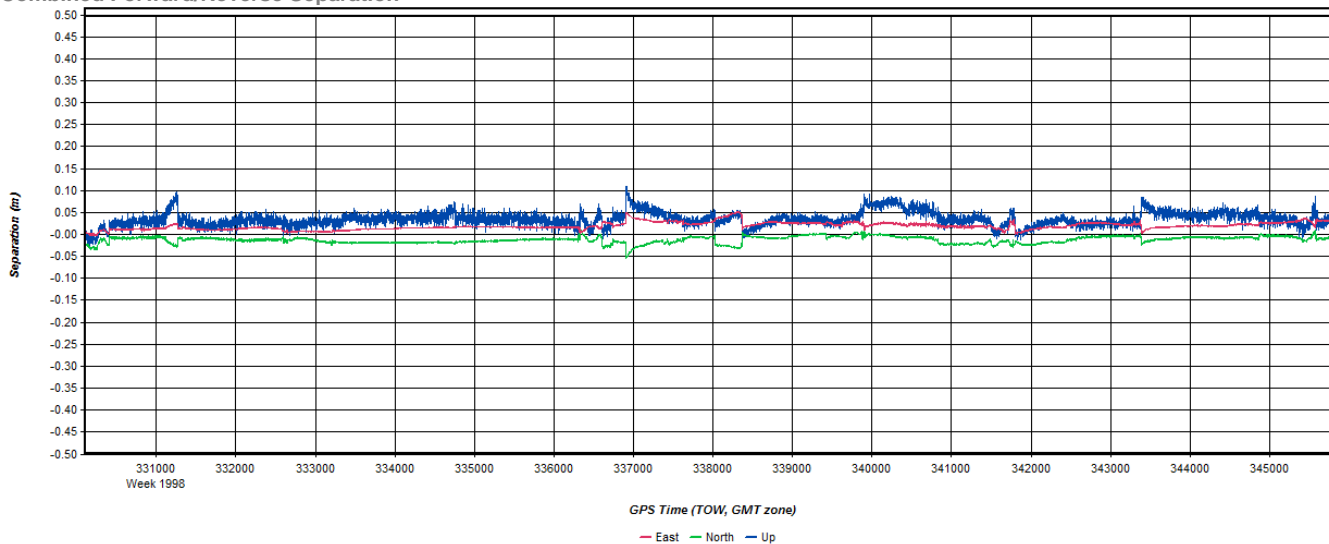
Quality Factor



Height



Combined Forward/Reverse Separation

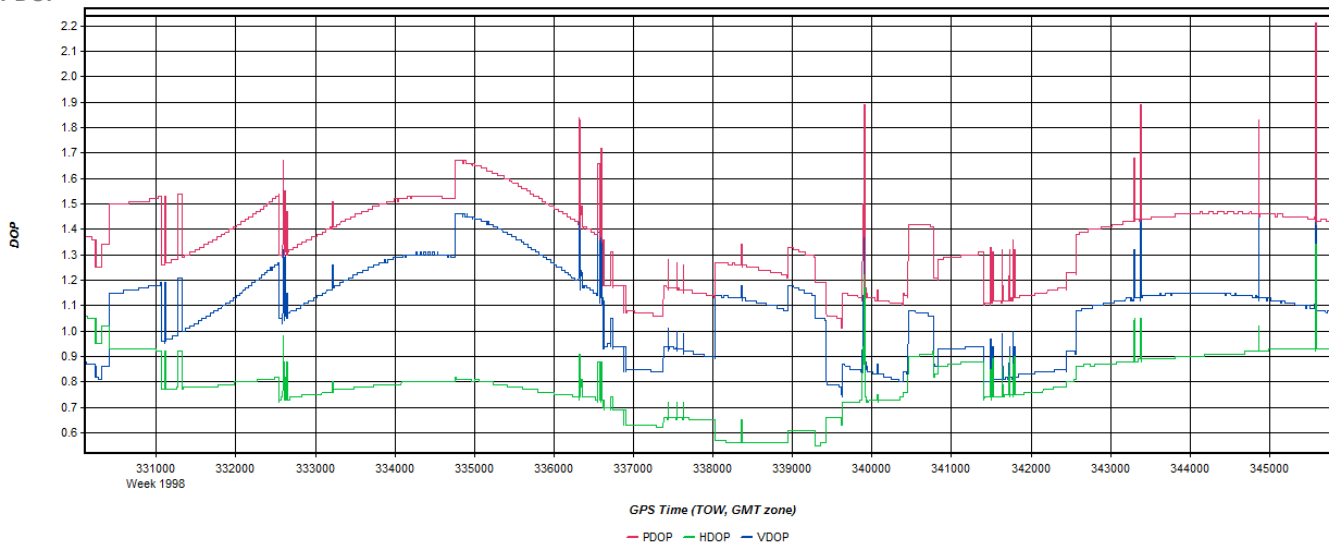


Combined Forward/Reverse Weighting

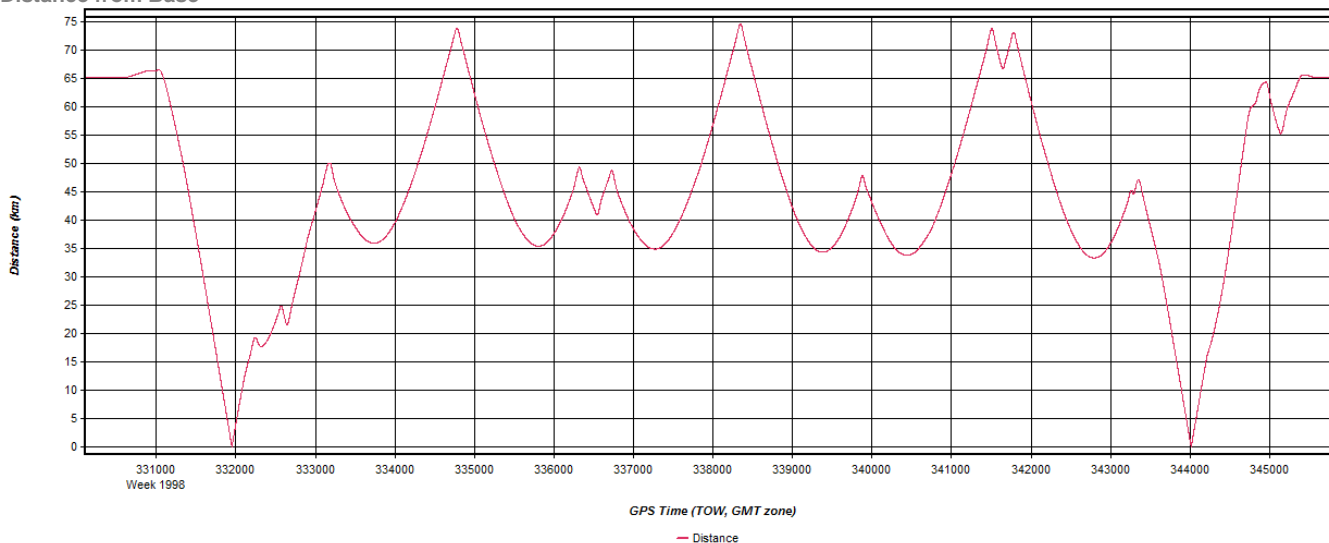




PDOP

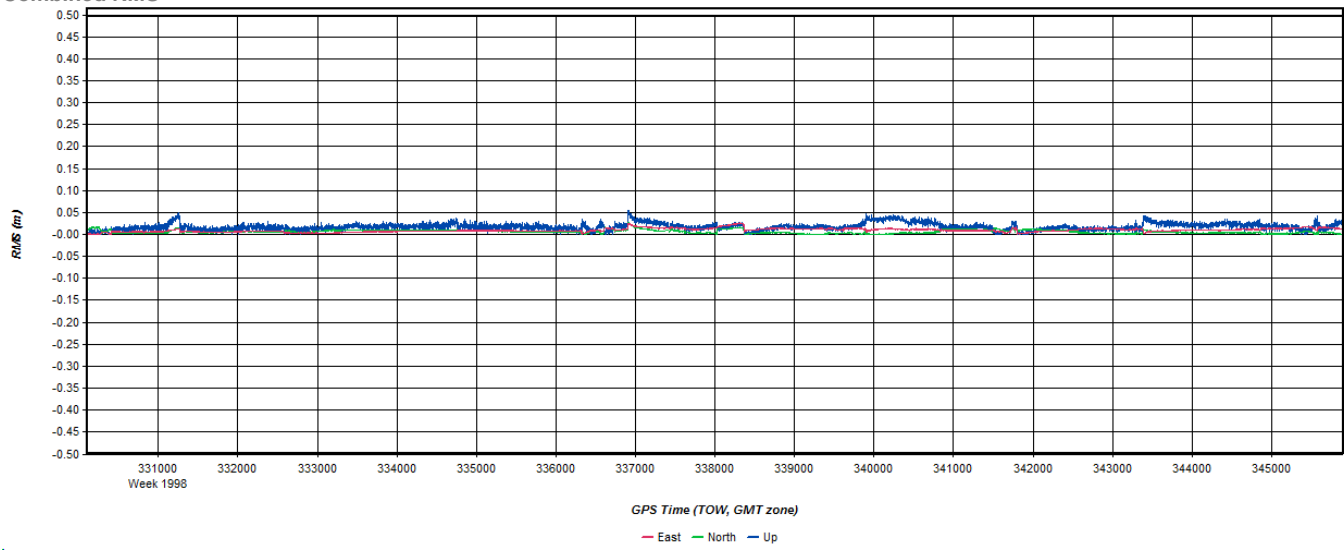


Distance from Base

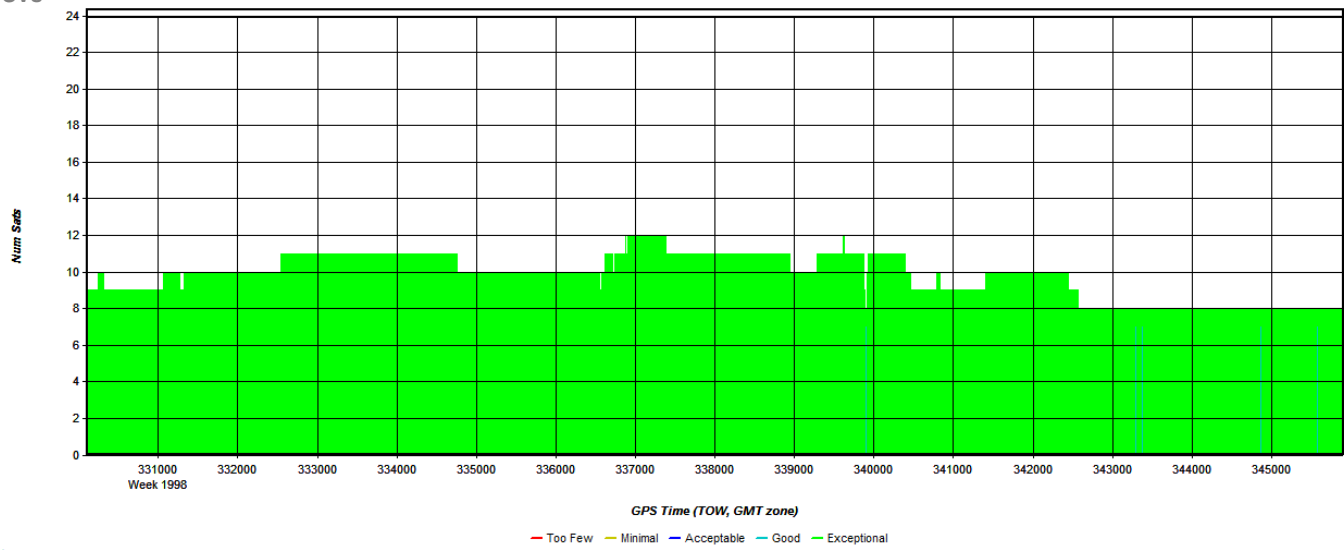


USGS COLLECTION REPORT

Combined RMS



SVs



**USGS
COLLECTION REPORT**

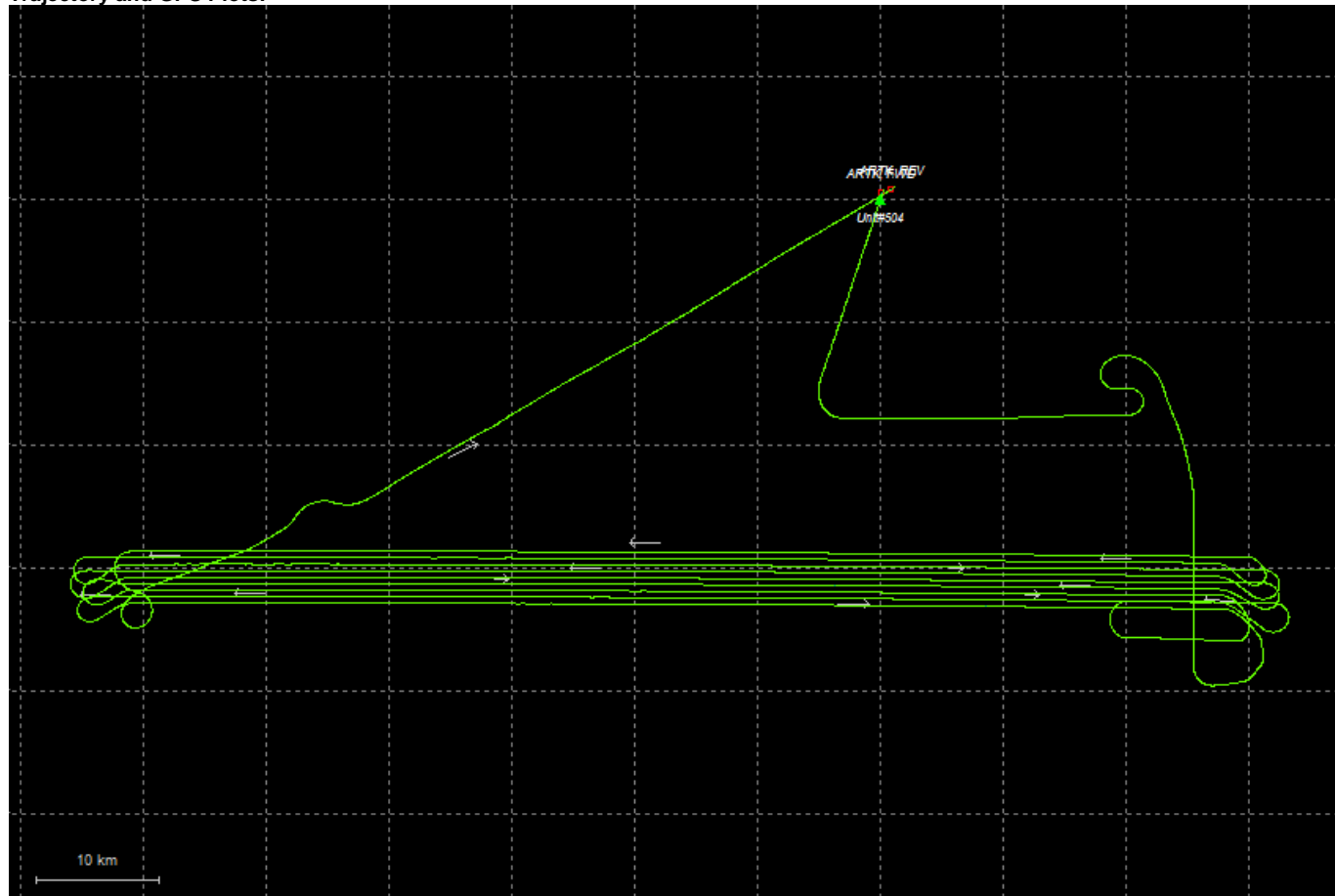


Acquisition and Processing details ----- (April 26, 2018)

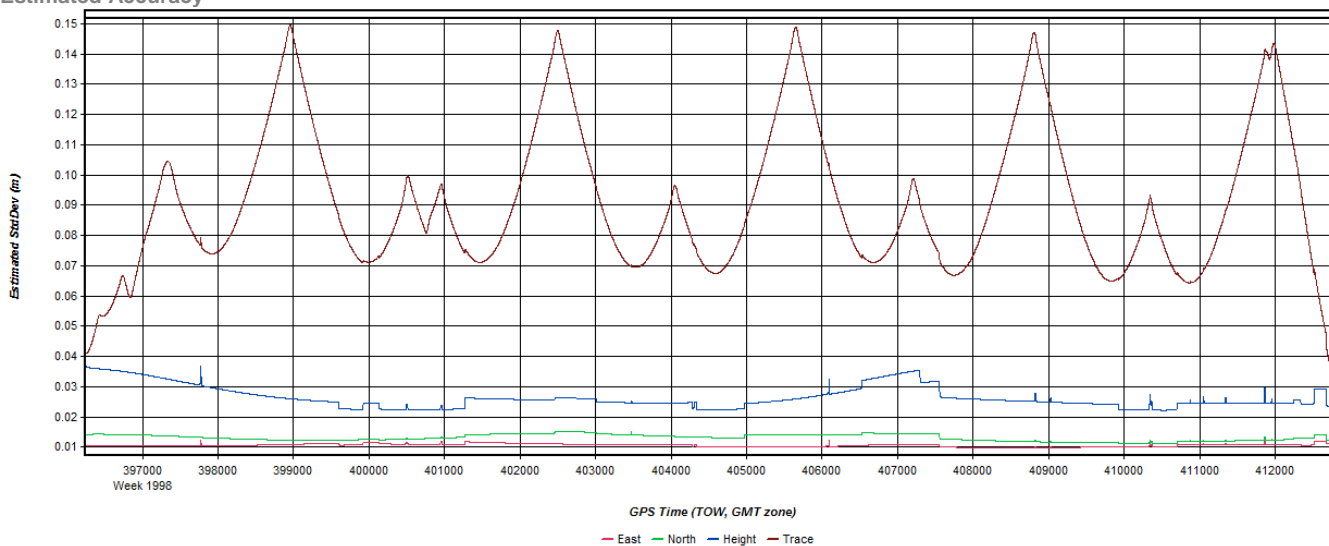
Log: 180426_165_33780055_06

FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02				
18.01																
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity							
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs								
1	KRAP	13:29	5.9	KRAP	19:09	11.0	5:40	5:75	5:1	0900-Production						
2																
3																
FGI Job # 33780055		Project Name SD USGS FY18			System 680i	Unit 165	IMU			Ground Temp °C 9.0 16.0	Min Range' 1542	Data Logger Drives 15				
Flight Date 25-Apr-18		GPS Day 18-115	Lift 6	Sun*		Solar Times (UTC)		Pulse Rate 330	Flying Temp °C 2.0 2.0		Max Range' 2933	Down load Drive				
Mission ID (yyymmdd_Sen_Job_Lift) 180425_165_33780055_06		Aircraft N97HC	Airport ID KRAP	FMS CCNS 8	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.20 30.21	Humidity @ Alt 20	Shipping Track		
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Riley Forsyth		Operator #2										
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50426a		Operator Rob Nelson		Data		
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions		SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End								
							13:37:00	13:42:00					ground static at KRAP		14	1.3
							14:01:00	14:06:02					overfly basestation		18	1.0
							14:11:39						s turn		15	1.1
W13X	2		67	45	29	19.4	14:17:33	14:19:55	S	5,465	127		cross tie line		15	1.3
W13F	14		194	1	84.9	0	14:24:11	14:47:31	W	5,489	122				15	1.4
	13		1	194	0	84.9	14:50:17	15:13:17	E	6,260	123				17	1.1
	13		194	184	84.9	80.5	15:16:57	15:18:37	W	5,611	123		calibration line		15	1.1
	12		194	1	84.9	0	15:23:37	15:46:44	W	5,491	119				16	1.1
	11		1	194	0	84.9	15:49:12	16:12:34	E	6,117	122				17	1.0
	10		194	1	84.9	0	16:15:36	16:38:59	W	5,461	127				17	1.1
	9		1	194	0	84.9	16:41:59	17:05:02	E	6,214	128				17	1.2
	8		194	1	84.9	0	17:08:11	17:31:45	W	5,320	124				17	1.3
	7		1	194	0	84.9	17:34:27	17:57:22	E	6,209	126				18	1.2
	6		194	1	84.9	0	18:00:11	18:23:36	W	5,430	128				18	1.1
							18:23:39						s turn		19	1.1
							18:38:21	18:43:42					overfly basestation		17	1.2
							19:00:00	19:05:00					ground static at KRAP		17	1.3

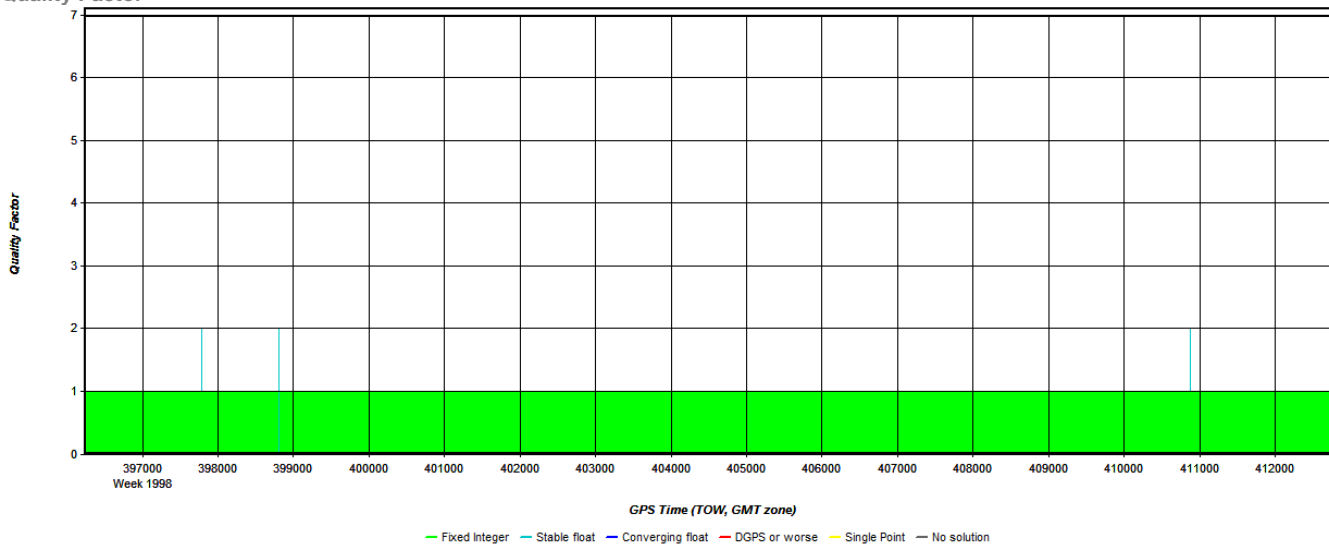
Trajectory and GPS Plots:



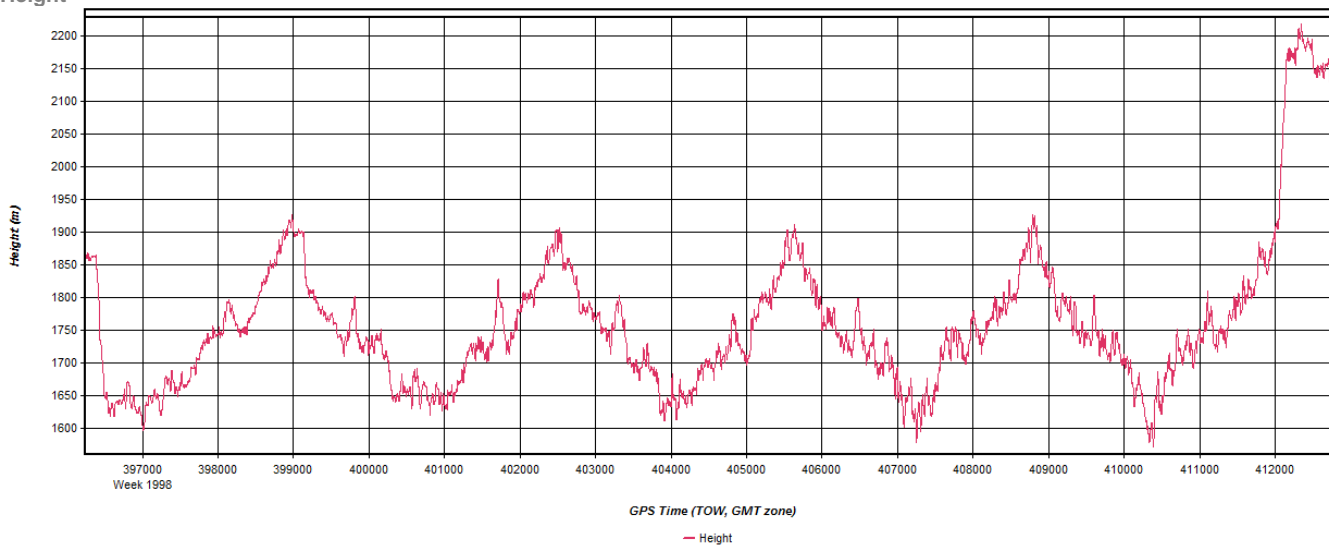
Estimated Accuracy



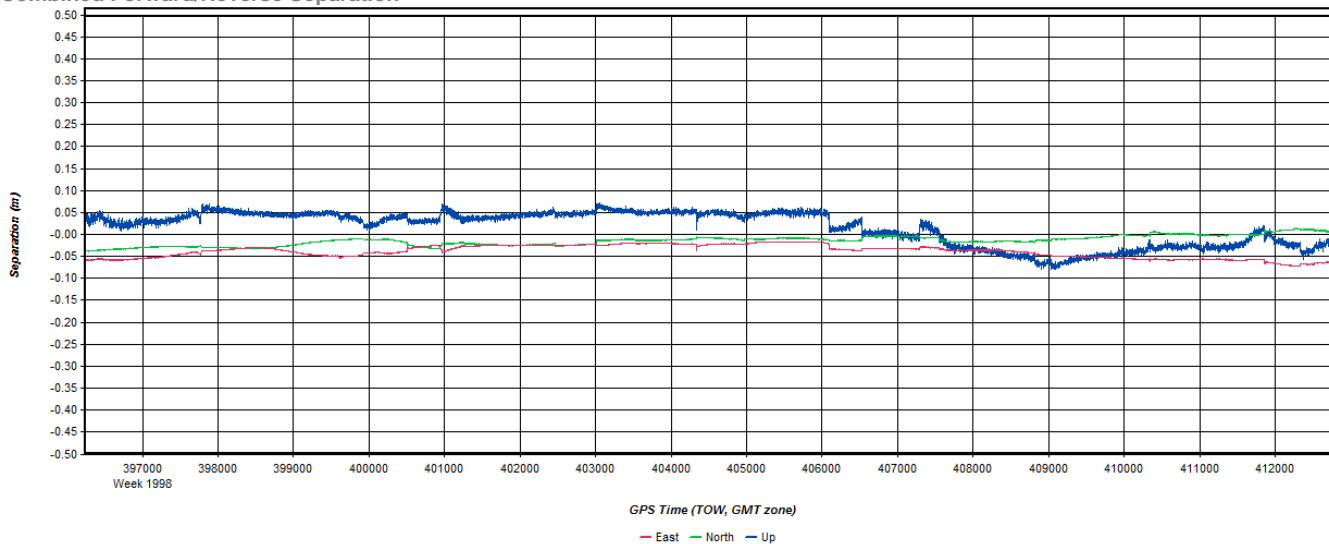
Quality Factor



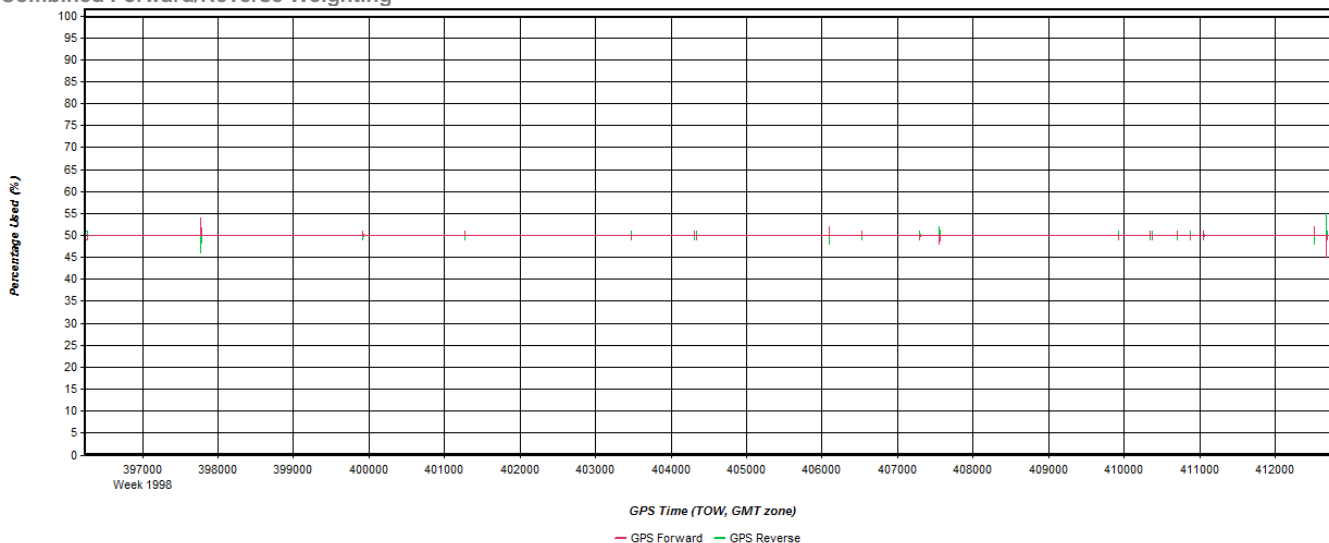
Height



Combined Forward/Reverse Separation



Combined Forward/Reverse Weighting

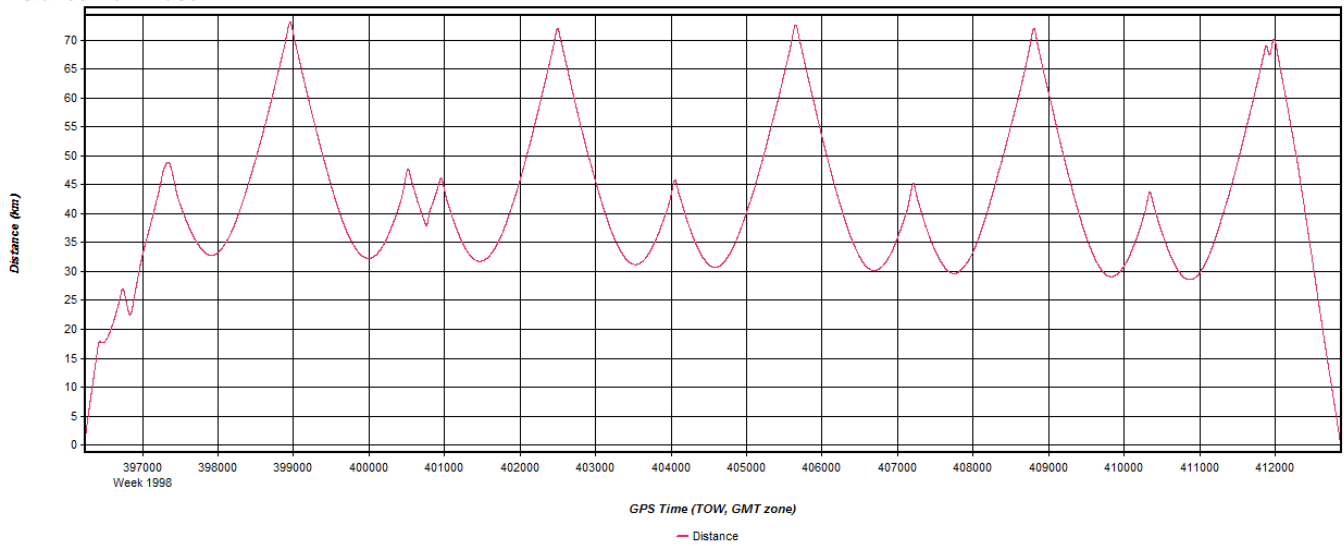


USGS COLLECTION REPORT

PDOP

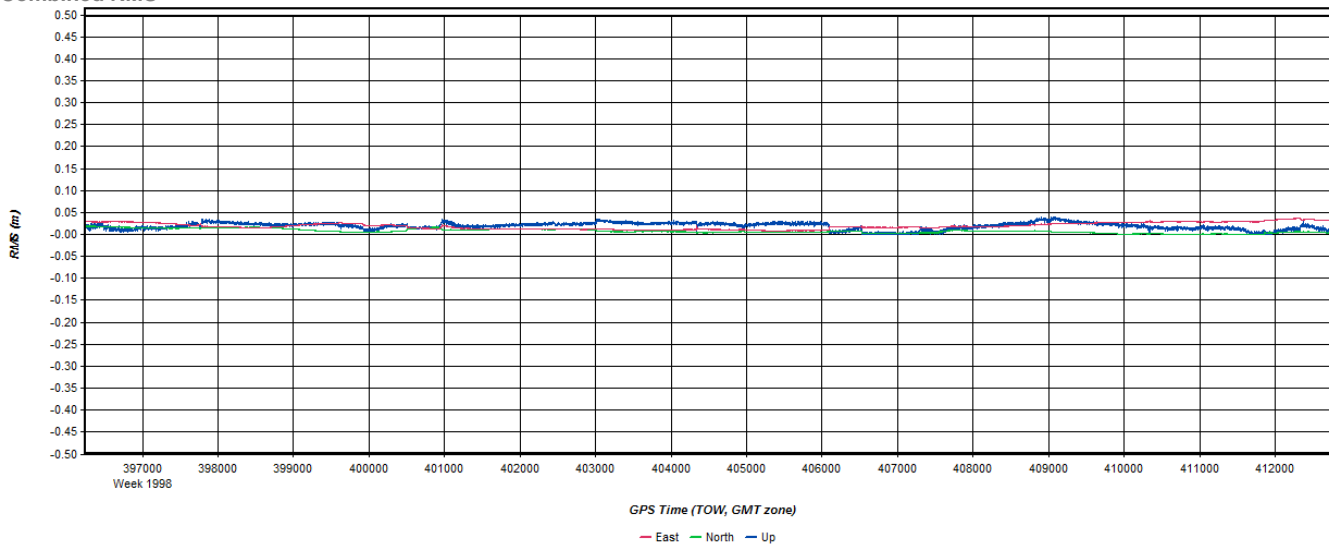


Distance from Base

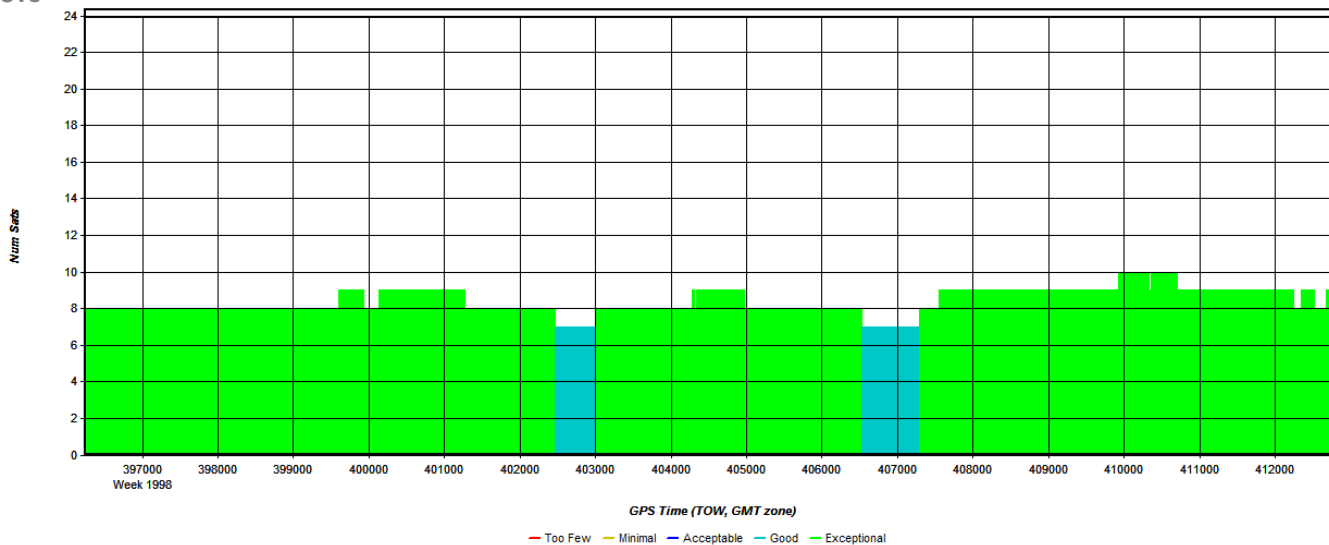




Combined RMS



SVs



**USGS
COLLECTION REPORT**

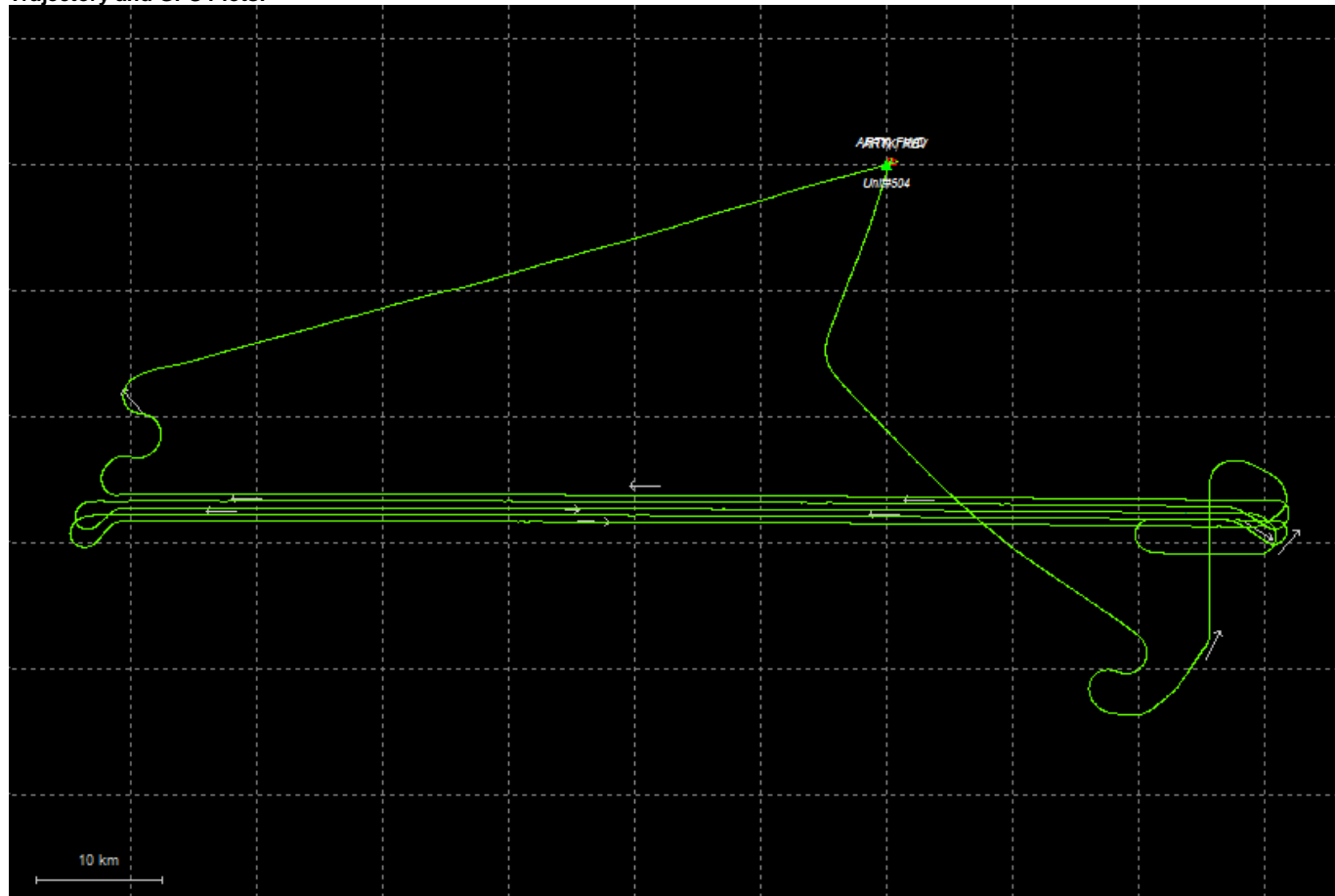


Acquisition and Processing details ----- (April 26, 2018)

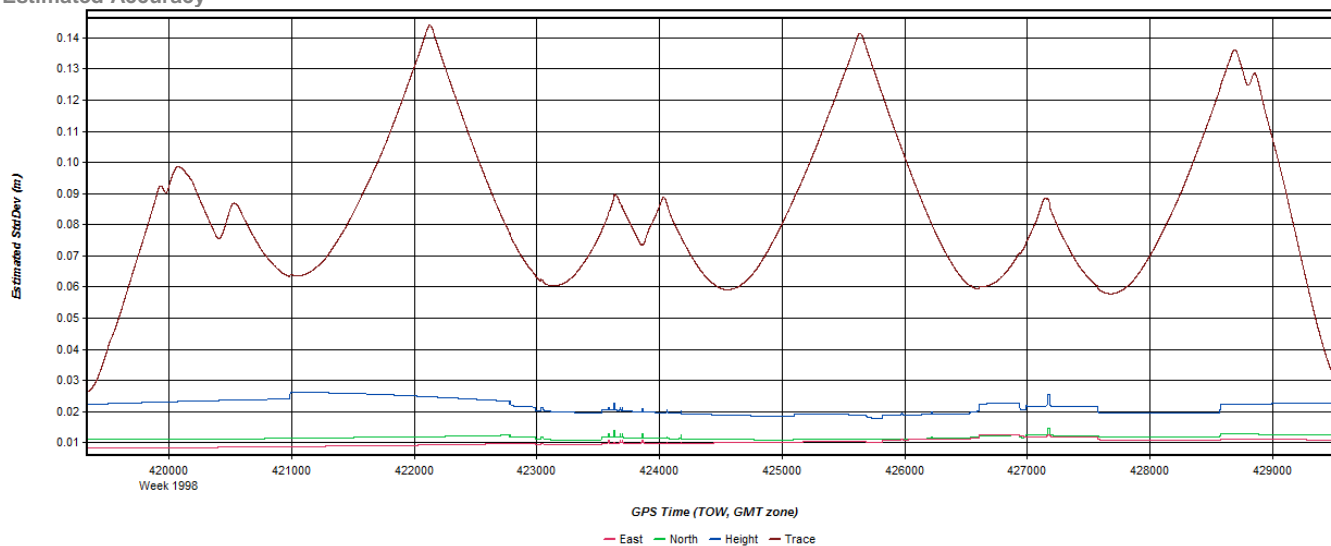
Log: 180426_165_33780055_07

FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02		
18.01														
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity					
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs						
1	KRAP	19:51	11.0	KRAP	23:46	14.3	3:55	4:00	3.3	0900-Production				
2														
3														
FGI Job #	Project Name				System	Unit	IMU				Ground Temp °C	Min Range'	Data Logger Drives	
33780055	SD USGS FY18				680i	165					15.0 18.0	1542	16	
Flight Date	GPS Day	Lift				Sun°	Solar Times (UTC)	Pulse Rate				Flying Temp °C	Max Range'	Download Drive
25-Apr-18	18-115	7						330				9.0 6.0	2933	
Mission ID (yyymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	AltM Setting	Humidity @ Alt	Shipping Track	
180425_165_33780055_07	N97HC	KRAP	CCNS 5	-6	2400	130		130	2	0.440	30.20 30.12	31		
Pilot #1	Pilot #2		Operator #1		Operator #2									
Grant Cassell			Riley Forsyth											
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator	Data	
7002	Buffalo Gap, SD		GR3-5	GR3-5	1.8					Unit#50426a		Rob Nelson		
Area	Flight #	Wpt	Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions		SVs	PDOP
			From	To	Begin	End					Start	End		
					19:57:00	20:02:00					ground static at KRAP		15	1.4
					20:25:55	20:31:00					overfly basestation		18	1.2
					20:37:43						s turn		18	1.2
W13X	2	50 67	21.6	29	20:43:40	20:46:01	N	5,353	114		cross tie line		19	1.2
W13F	5	194 1	84.9	0	20:49:33	21:13:39	W	5,375	119				19	1.2
	4	1 194	0	84.9	21:16:35	21:38:53	E	6,215	129				17	1.3
	4	194 184	84.9	80.5	21:42:17	21:43:42	W	5,404	111		calibration line		18	1.0
	3	194 1	84.9	0	21:48:27	22:12:14	W	5,295	112				18	1.0
	2	1 194	0	84.9	22:15:00	22:37:18	E	6,095	123				18	1.0
	1	194 1	84.9	0	22:40:28	23:03:53	W	5,483	126				17	1.0
					23:04:04						s turn		16	1.2
					23:16:44	23:21:46					overfly basestation		15	1.2
					23:39:00	23:44:00					ground static at KRAP		15	1.4

Trajectory and GPS Plots:

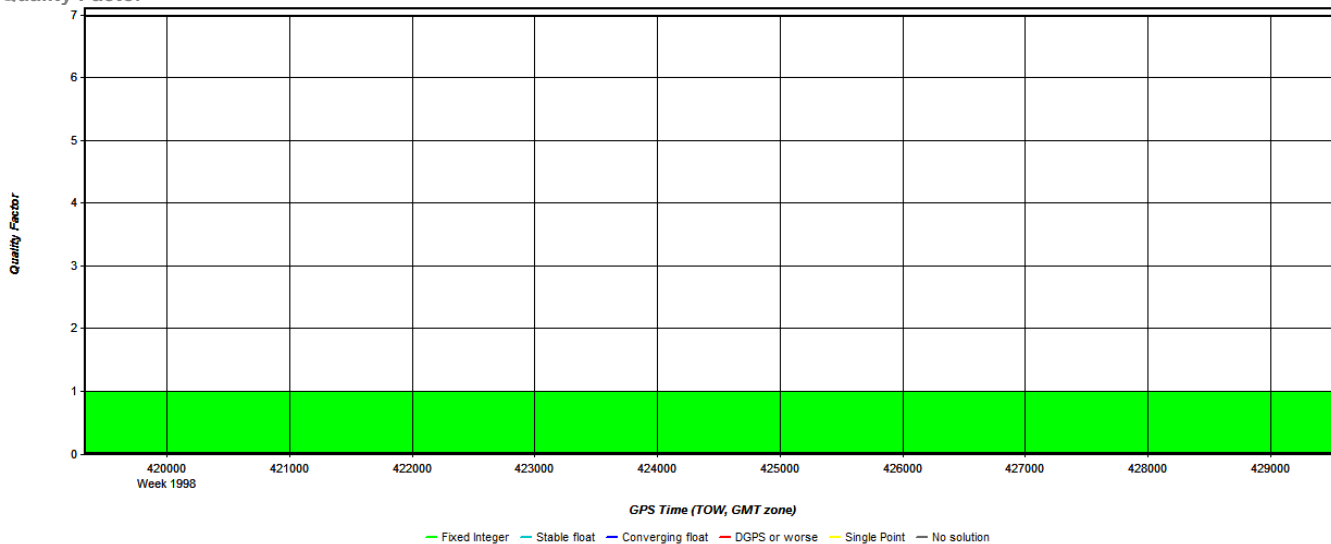


Estimated Accuracy

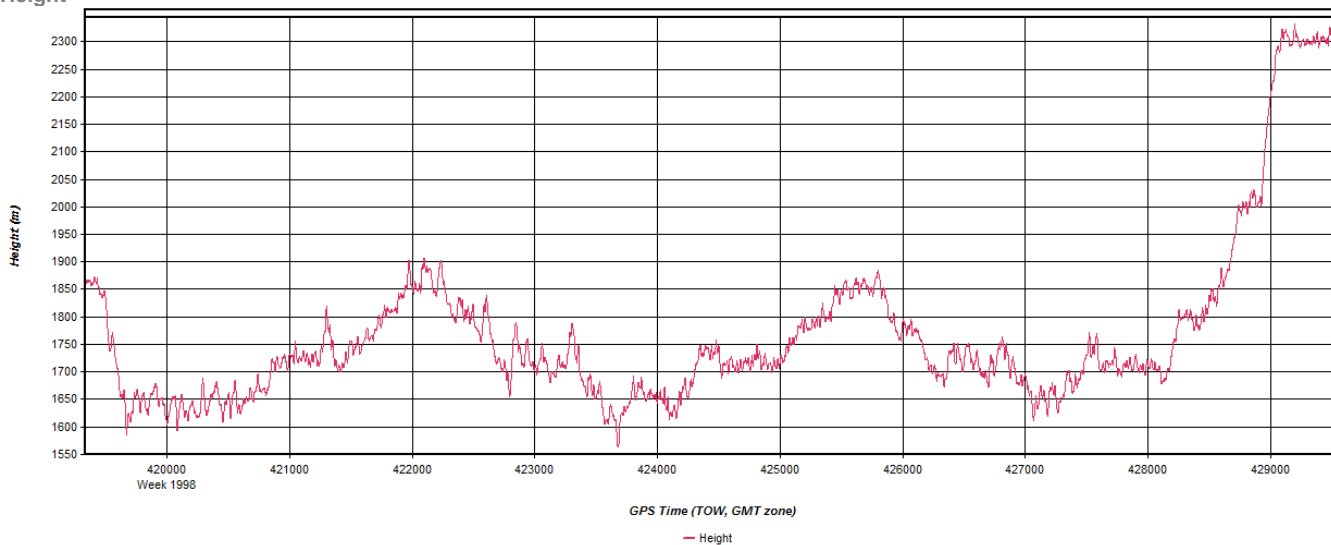




Quality Factor

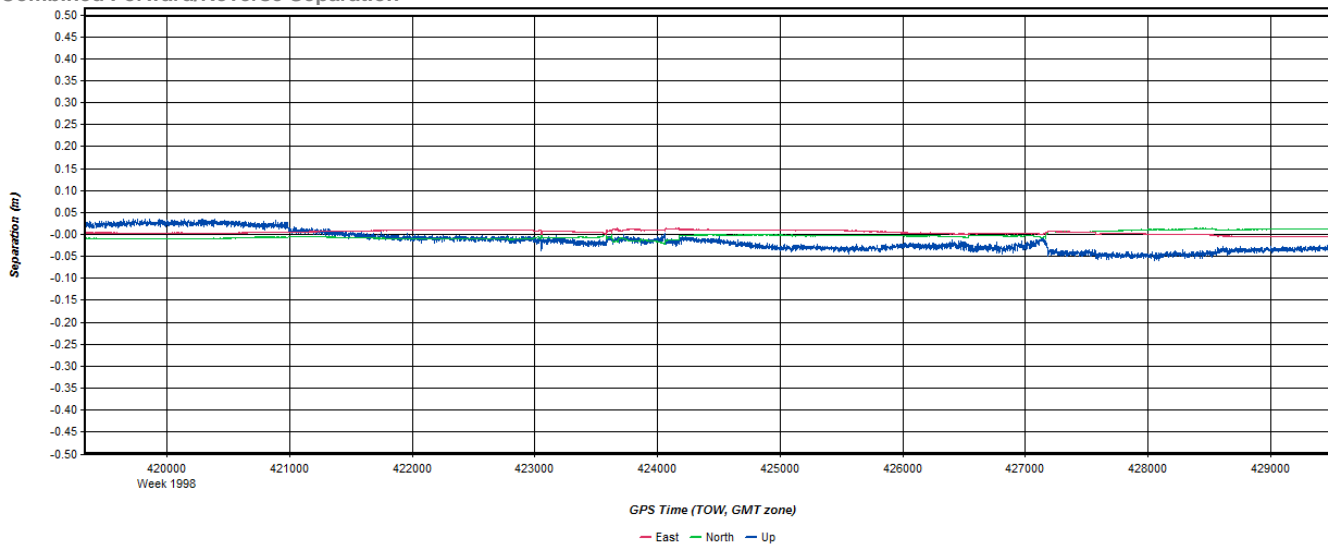


Height

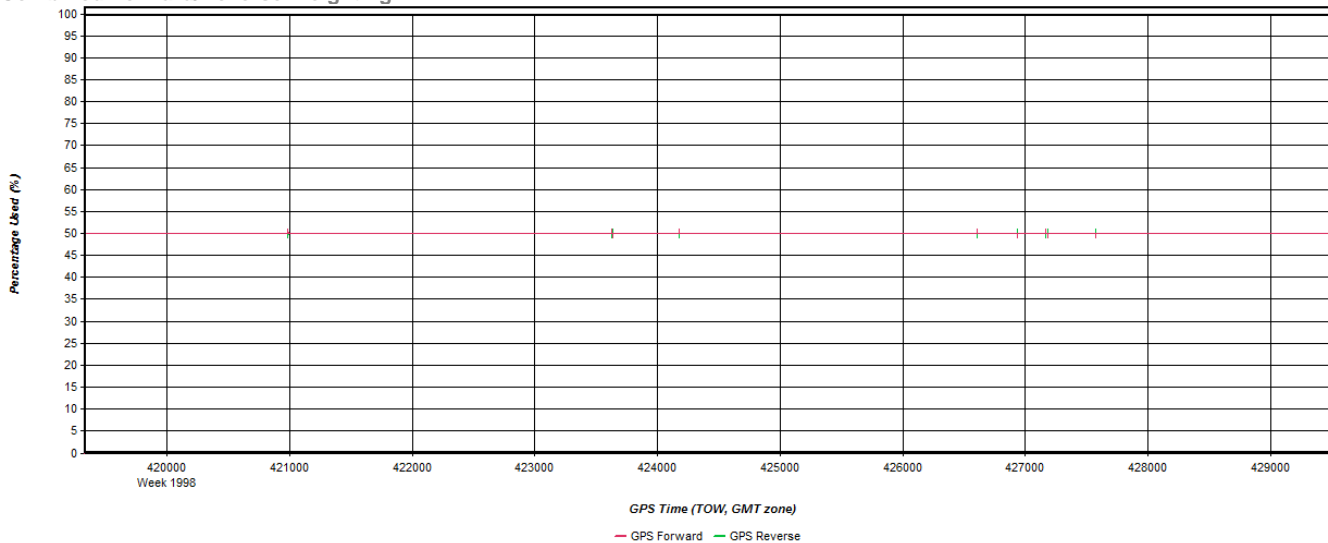




Combined Forward/Reverse Separation

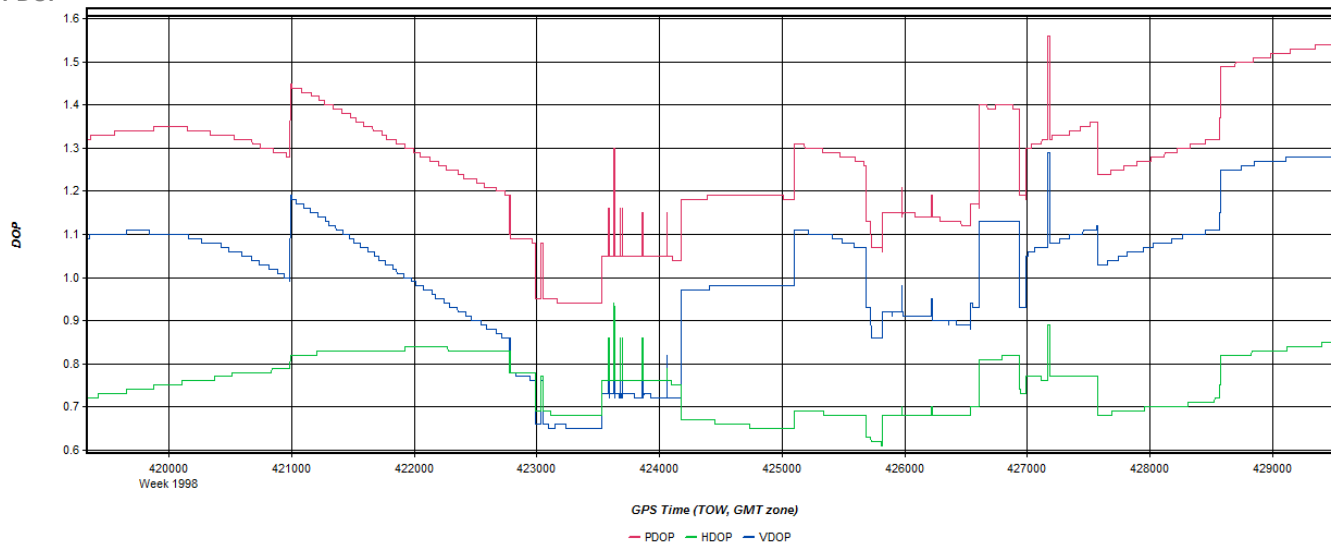


Combined Forward/Reverse Weighting

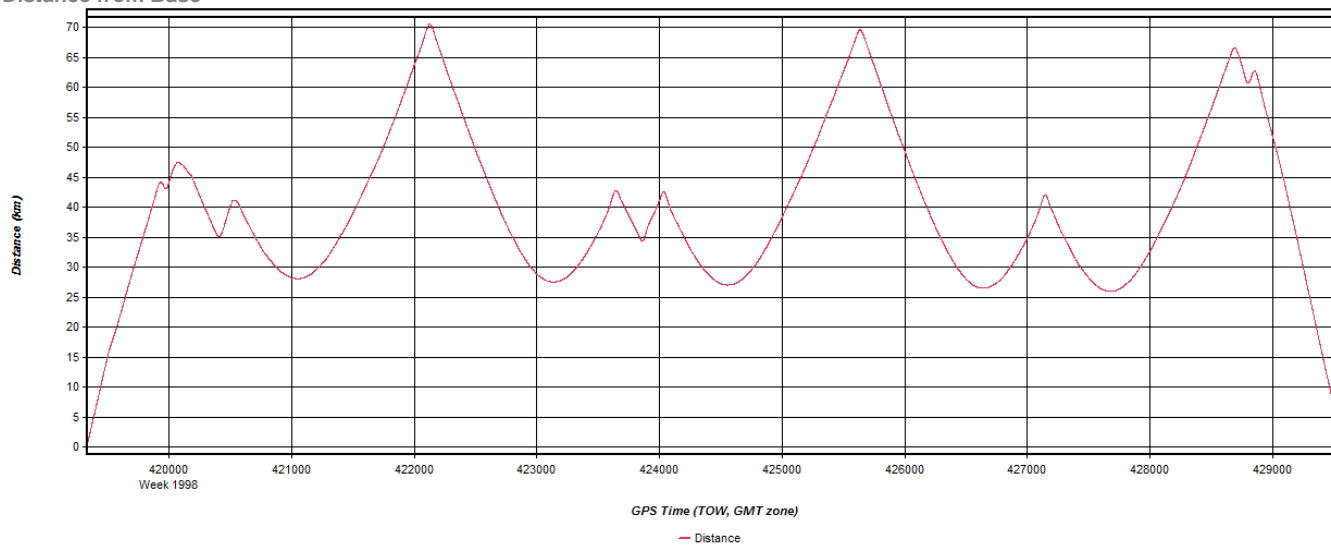




PDOP

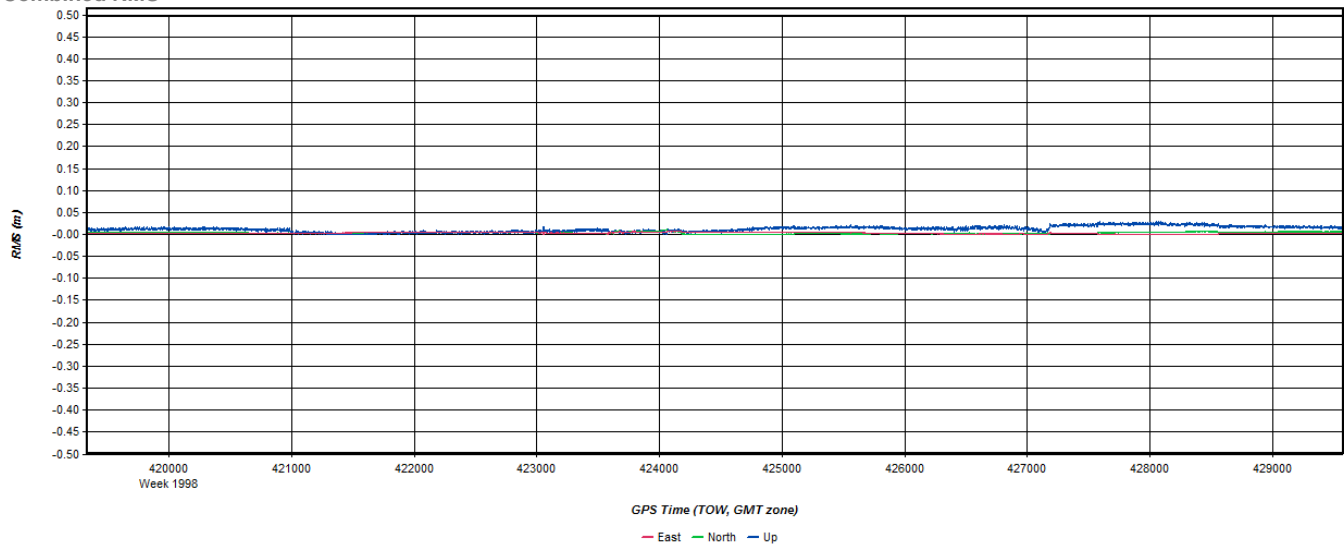


Distance from Base

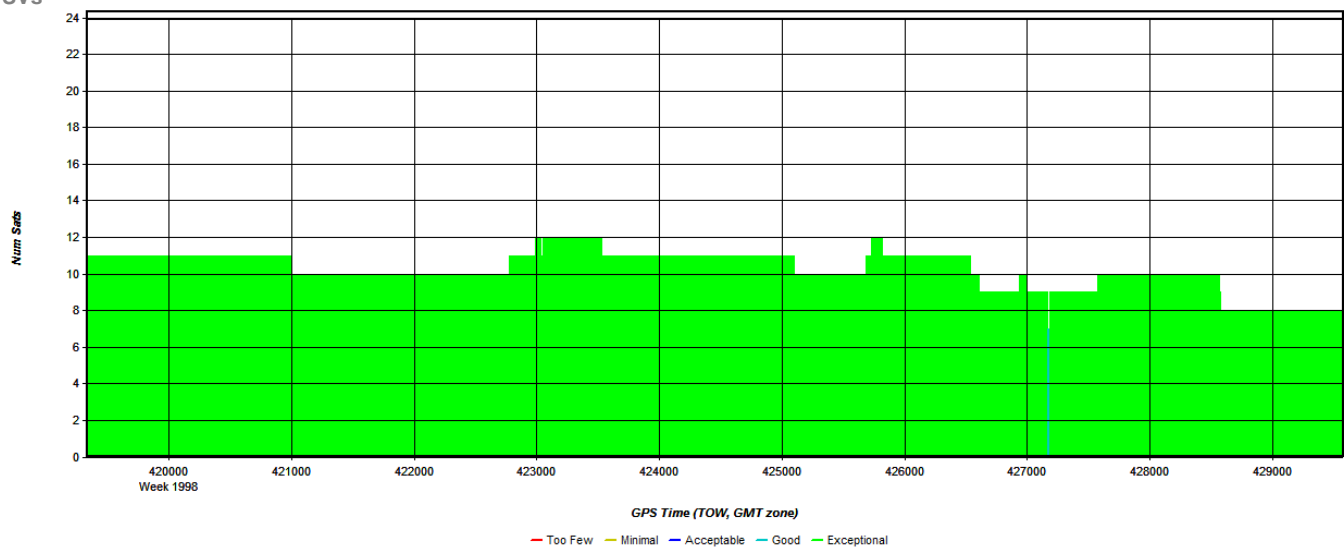


USGS COLLECTION REPORT

Combined RMS



SVs



**USGS
COLLECTION REPORT**



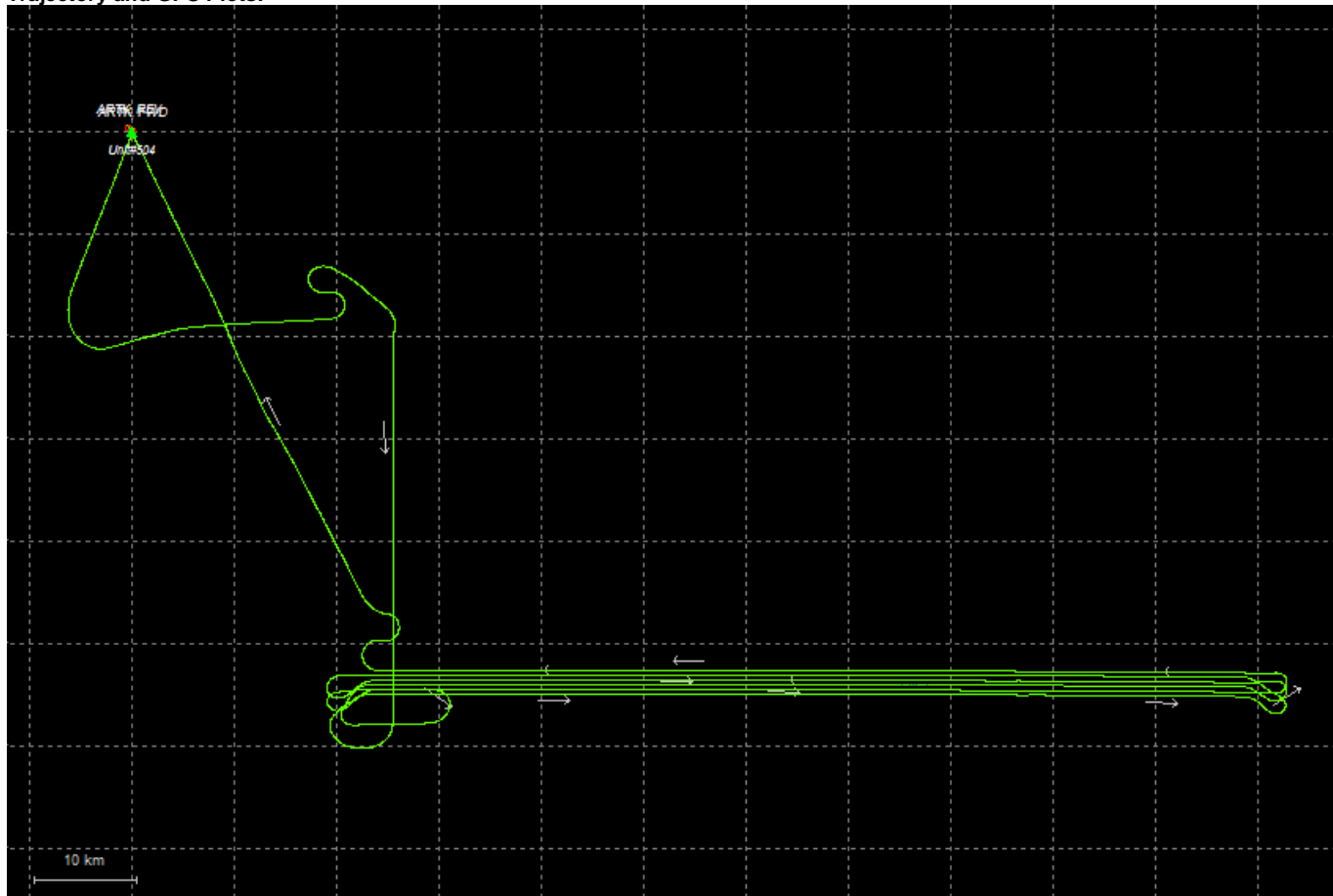
Acquisition and Processing details ----- (April 27, 2018)

Log: 180427_165_33780055_08

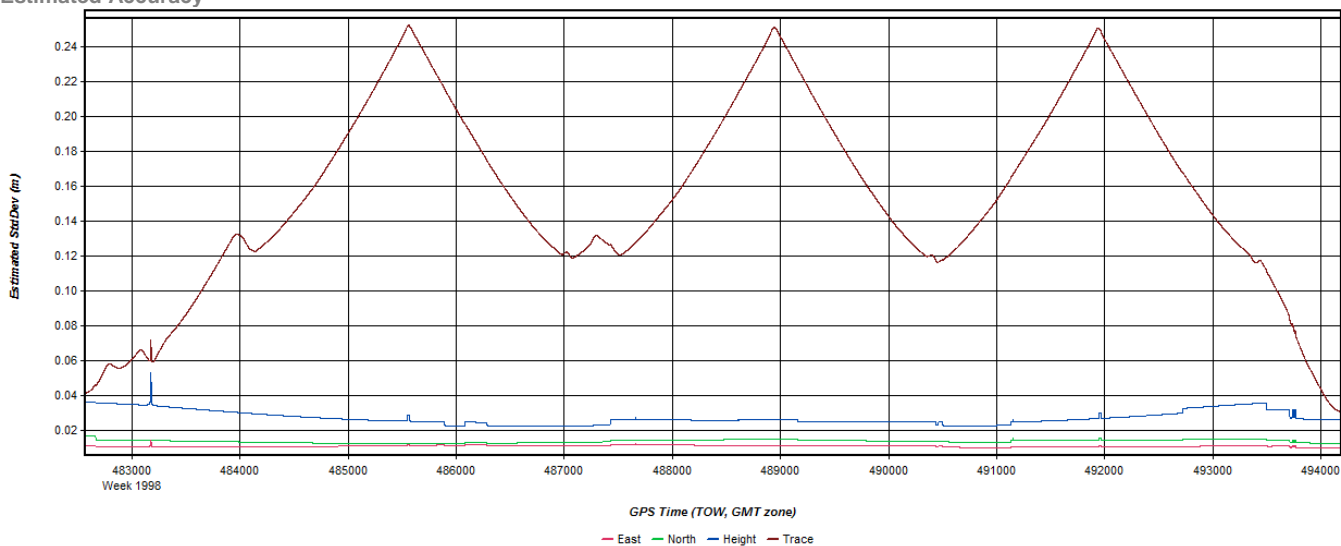
FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02		
18.01														
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity					
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs						
1	KRAP	13:30	14:3	KRAP	17:50	18.1	4:20	4:25	3.8	0900-Production				
2														
3														

FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU					Ground Temp °C 9.0 17.0	Min Range' 1542	Data Logger Drives 16			
Flight Date 27-Apr-18	GPS Day 18-117	Lift 8	Sun*		Solar Times (UTC)	Pulse Rate 330			Flying Temp °C 10.0 10.0	Max Range' 2933	Download Drive				
Mission ID (yyymmdd_Sen_Job_Lift) 180427_165_33780055_08	Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.06 30.11	Humidity @ Alt 53	Shipping Track		
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50427a	Operator Rob Nelson	Data			
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate			
							13:35:00	13:40:00					ground static at KRAP	14	1.3
							13:59:49	14:04:49					overfly basestation	15	1.3
							14:10:46						s turn	16	1.3
13EX	2		78	1	33.9	0	14:15:38	14:24:42	S	5,300	126		cross tie line	16	1.4
13E	66		1	189	0	82.7	14:29:01	14:51:01	E	5,677	125			16	1.3
	65		189	1	82.7	0	14:53:46	15:15:38	W	5,833	120			18	1.0
	65		1	10	0	4	15:18:45	15:20:05	E	5,717	119		calibration line	17	1.2
	64		1	189	0	82.7	15:25:26	15:47:28	E	5,748	118			16	1.2
	63		189	1	82.7	0	15:50:10	16:11:54	W	5,863	124			17	1.0
	62		1	189	0	82.7	16:15:09	16:37:18	E	5,722	122			17	1.1
	61		189	1	82.7	0	16:40:05	17:01:49	W	5,770	123			17	1.2
							17:01:54						s turn	17	1.2
							17:13:42	17:18:43					overfly basestation	17	1.2
							17:38:00	17:43:00					ground static at KRAP	16	1.6

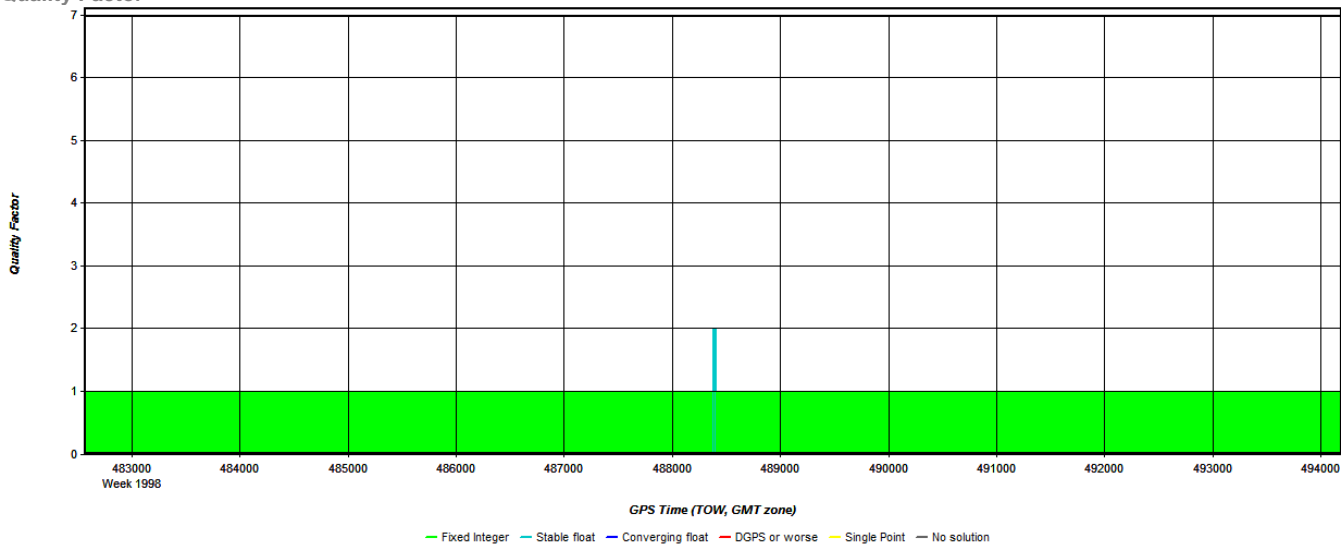
Trajectory and GPS Plots:



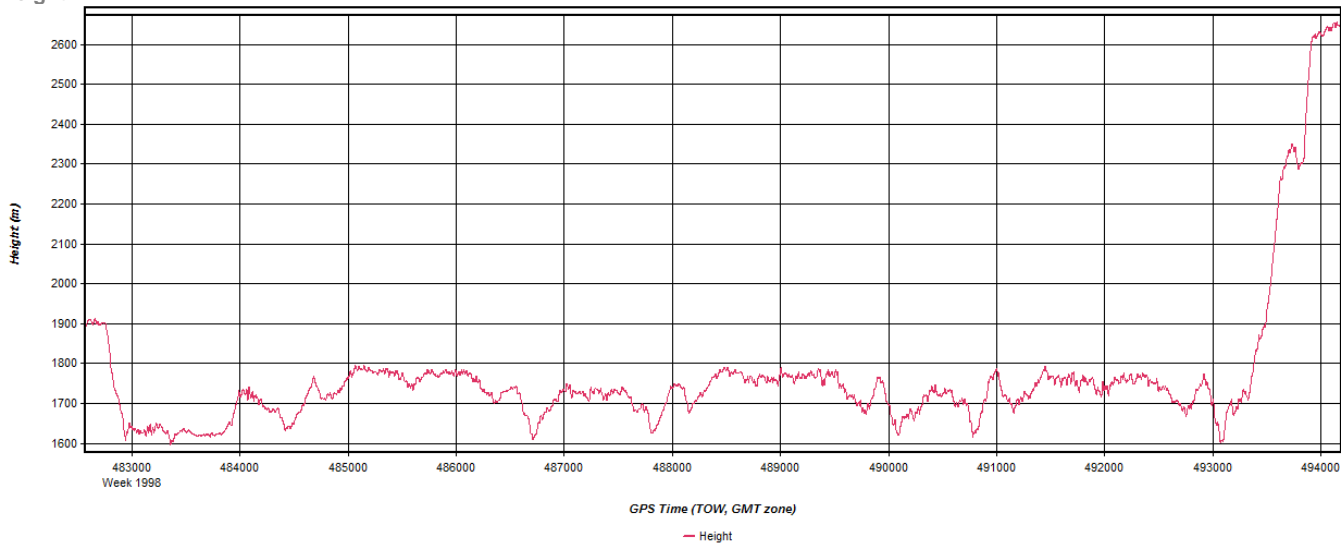
Estimated Accuracy



Quality Factor

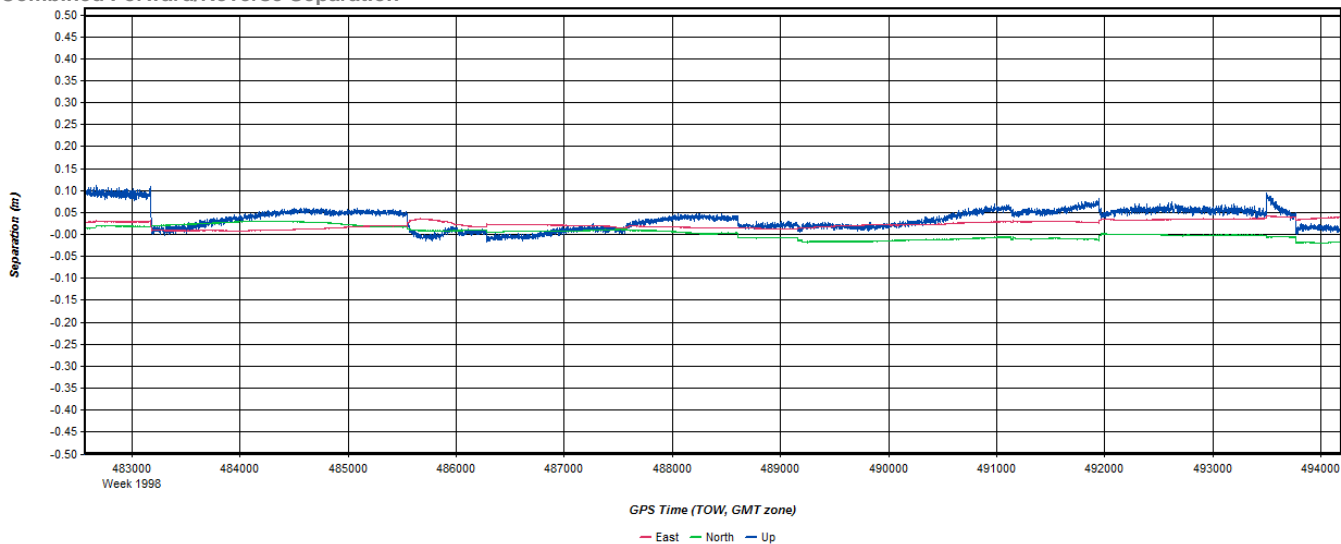


Height

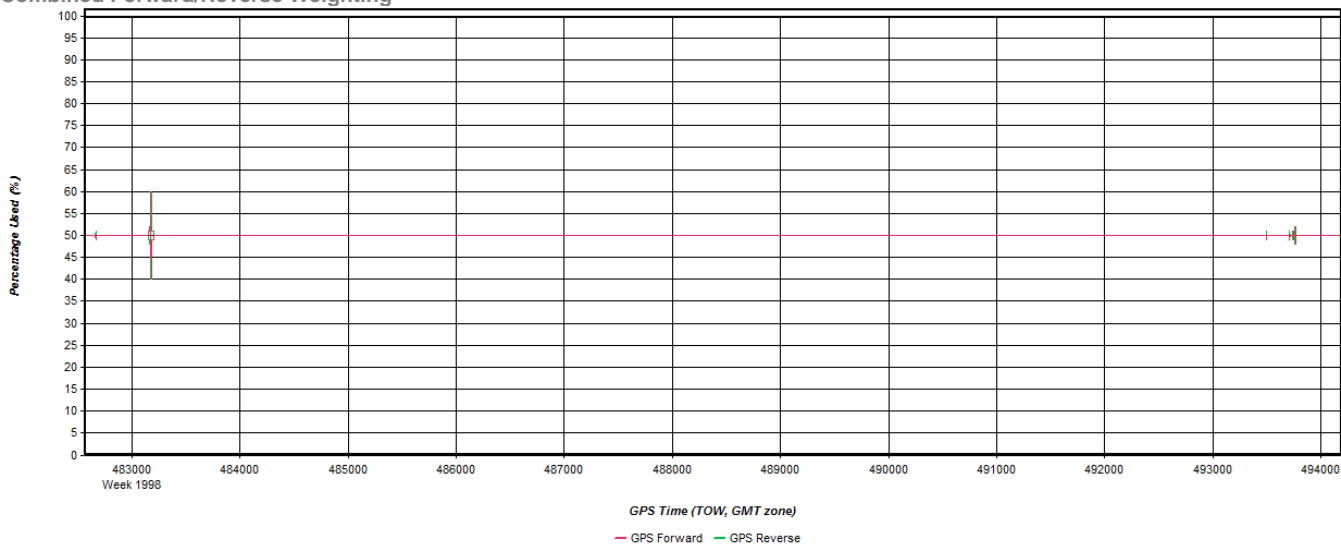




Combined Forward/Reverse Separation

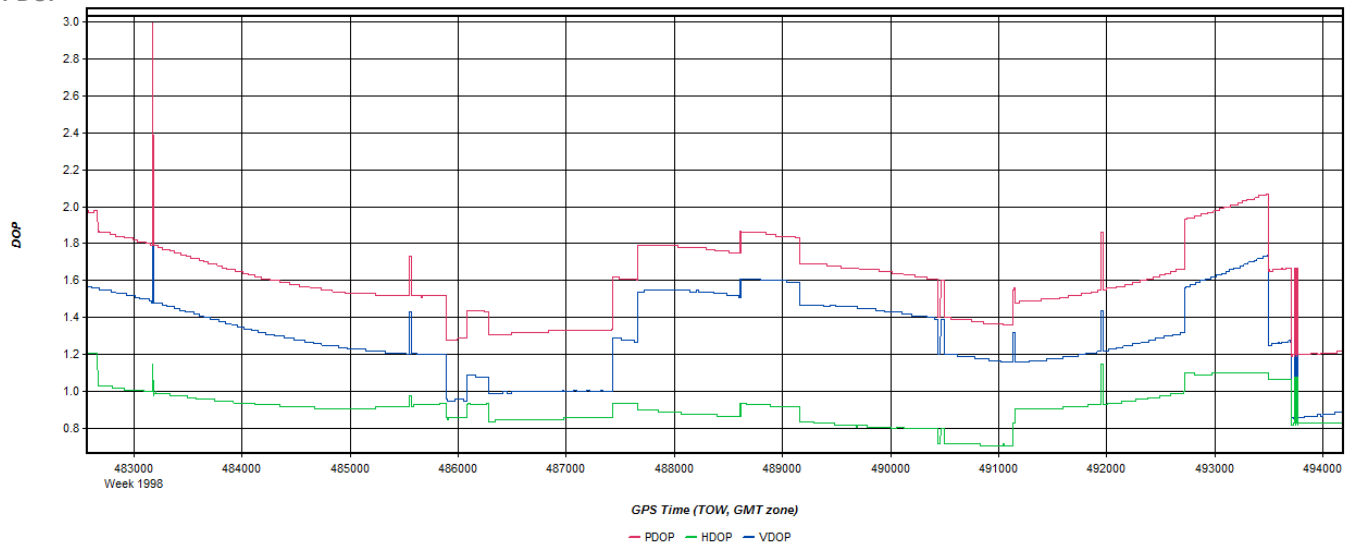


Combined Forward/Reverse Weighting

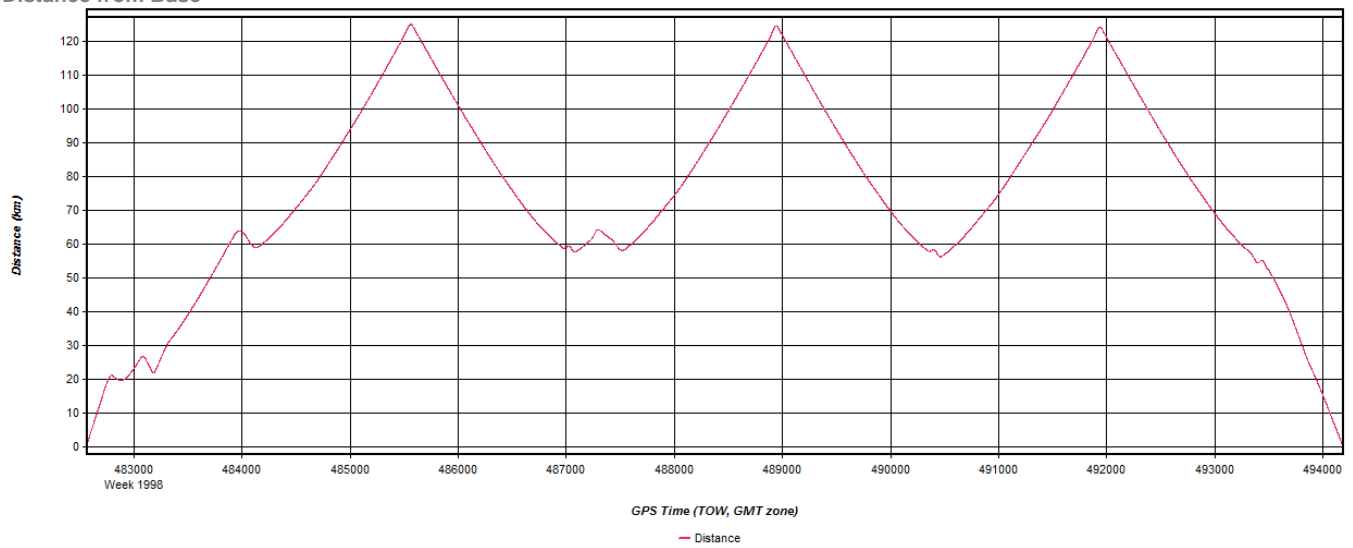


USGS COLLECTION REPORT

PDOP

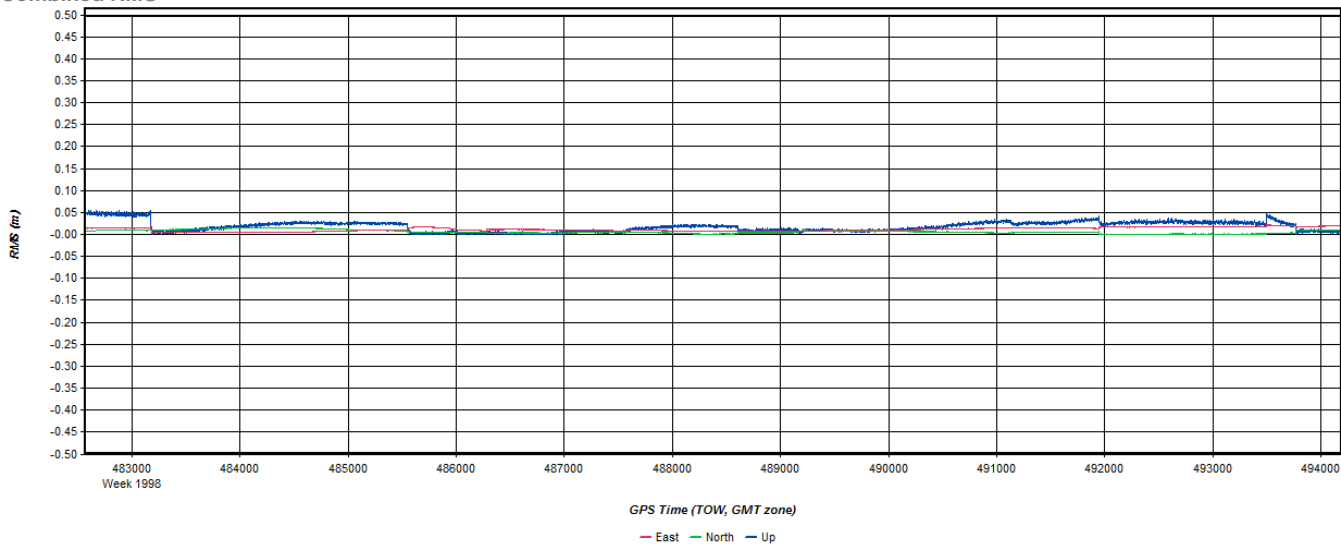


Distance from Base

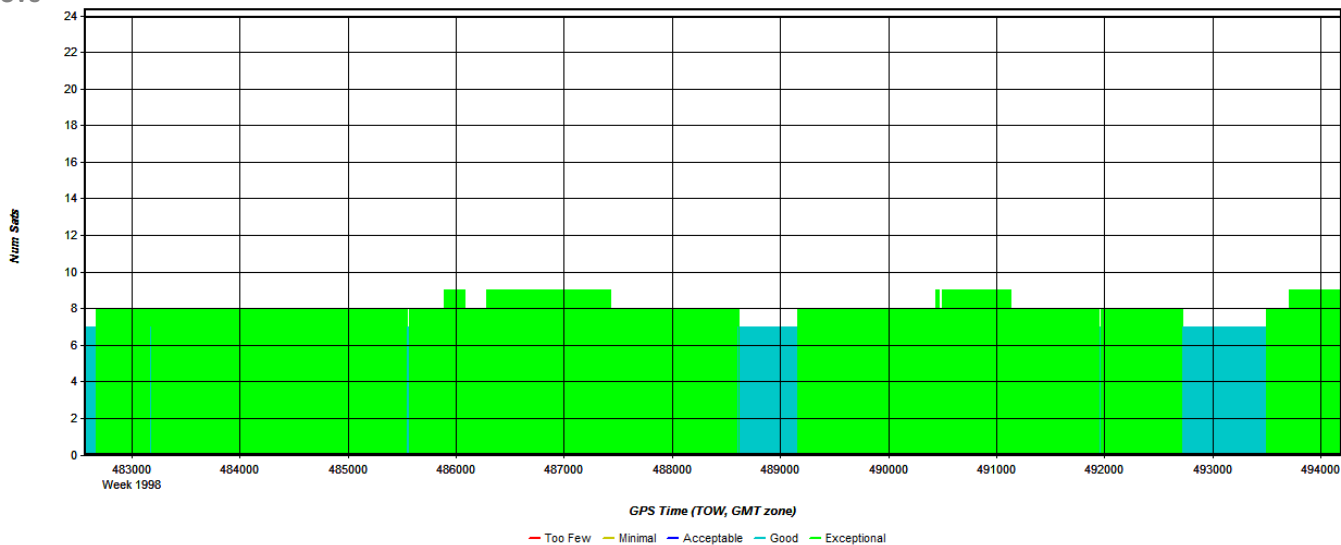




Combined RMS



SVs



**USGS
COLLECTION REPORT**



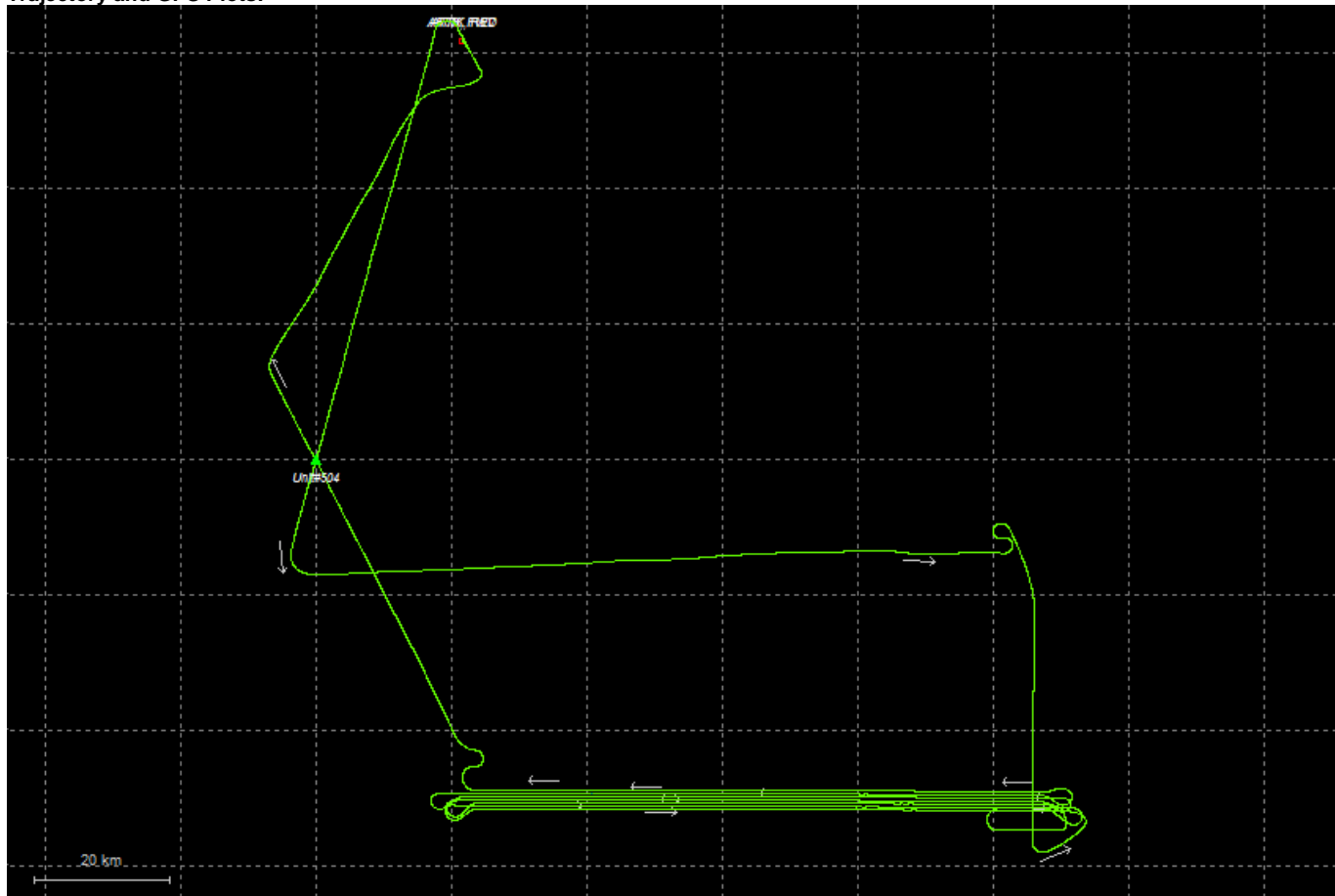
Acquisition and Processing details ----- (April 27, 2018)

Log: 180427_165_33780055_09

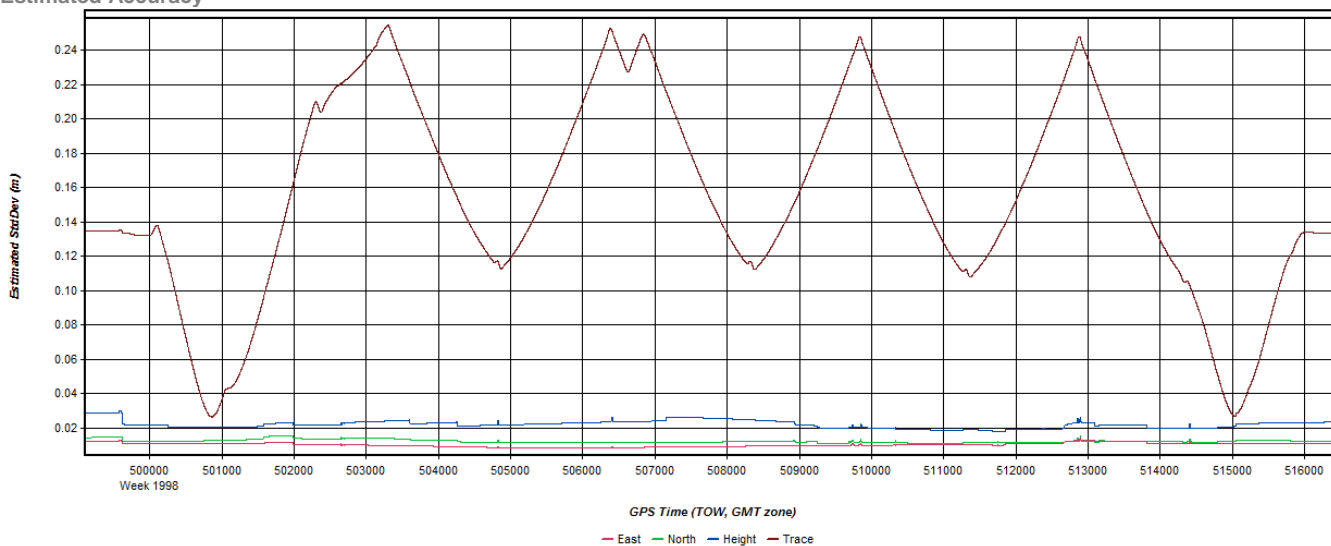
FUGRO USA Land, Inc.												Riegl Flight Log AC80-50-00-02	
18.01													
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity				
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs					
1	KRAP	18:34	18.1	KRAP	23:30	22.5	4:56	5.00	4.4	0900-Production			
2													
3													

FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU					Ground Temp °C 17.0 20.0	Min Range' 1542	Data Logger Drives 15			
Flight Date 27-Apr-18	GPS Day 18-117	Lift 9		Sun°	Solar Times (UTC)	Pulse Rate 330				Flying Temp °C 12.0 5.0	Max Range' 2933	Down load Drive			
Mission ID (yyymmdd_Sen_Job_Lift) 180427_165_33780055_09		Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.10 30.04	Humidity @ Alt 34	Shipping Track	
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename Unit#50427a	Operator Rob Nelson	Data			
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate			
							18:40:00	18:45:00					ground static at KRAP	14	1.5
							19:04:47	19:09:48					overfly basestation	19	1.2
							19:30:53						s turn	18	1.1
13EX	1		72	1	33.9	0	19:36:47	19:45:03	S	5,606	125		cross tie line	18	1.1
13E	60		189	1	82.7	0	19:50:02	20:12:20	W	5,856	120			18	1.1
	59		1	189	0	82.7	20:15:22	20:37:31	E	5,728	120			19	1.2
	59		189	179	82.7	78.3	20:41:19	20:42:46	W	5,825	122		calibration line	19	1.2
	58		189	1	82.7	0	20:48:46	21:10:43	W	5,836	118			19	1.2
	57		1	189	0	82.7	21:13:45	21:35:38	E	5,722	122			17	1.2
	56		189	1	82.7	0	21:38:22	22:00:29	W	5,790	130			19	1.0
	55		1	189	0	82.7	22:04:01	22:26:16	E	5,675	120			20	0.9
	54		189	1	82.7	0	22:29:05	22:50:30	W	5,697	125			18	1.0
							22:50:42						s turn	16	1.1
							23:01:17	23:06:17					overfly basestation	16	1.2
							23:23:04						ground static at KRAP	17	1.1

Trajectory and GPS Plots:

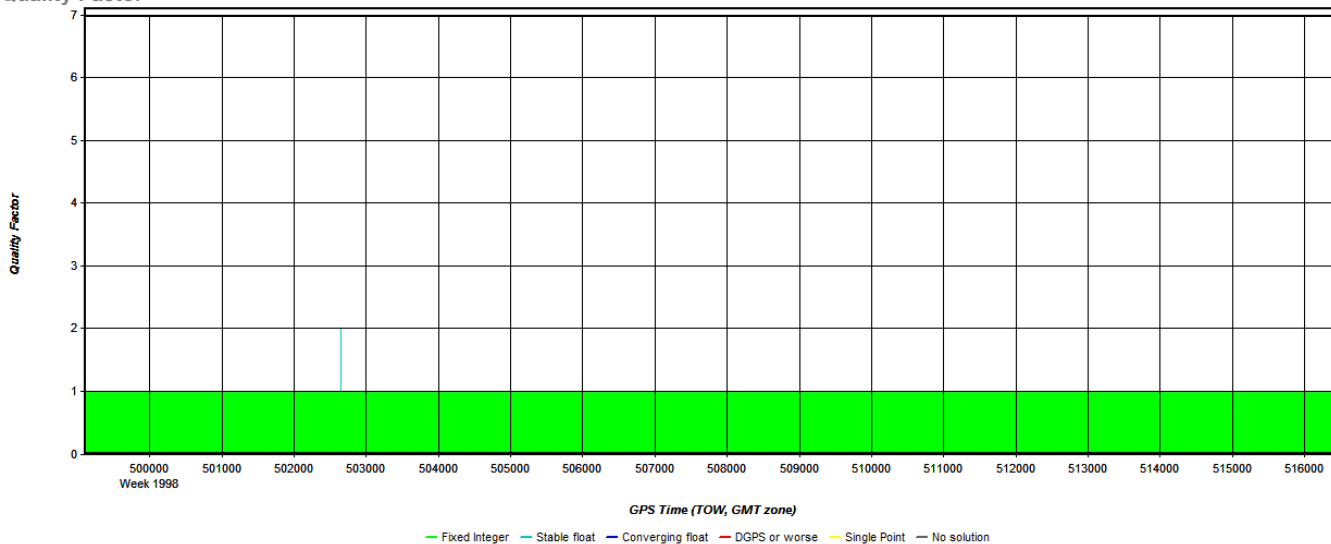


Estimated Accuracy

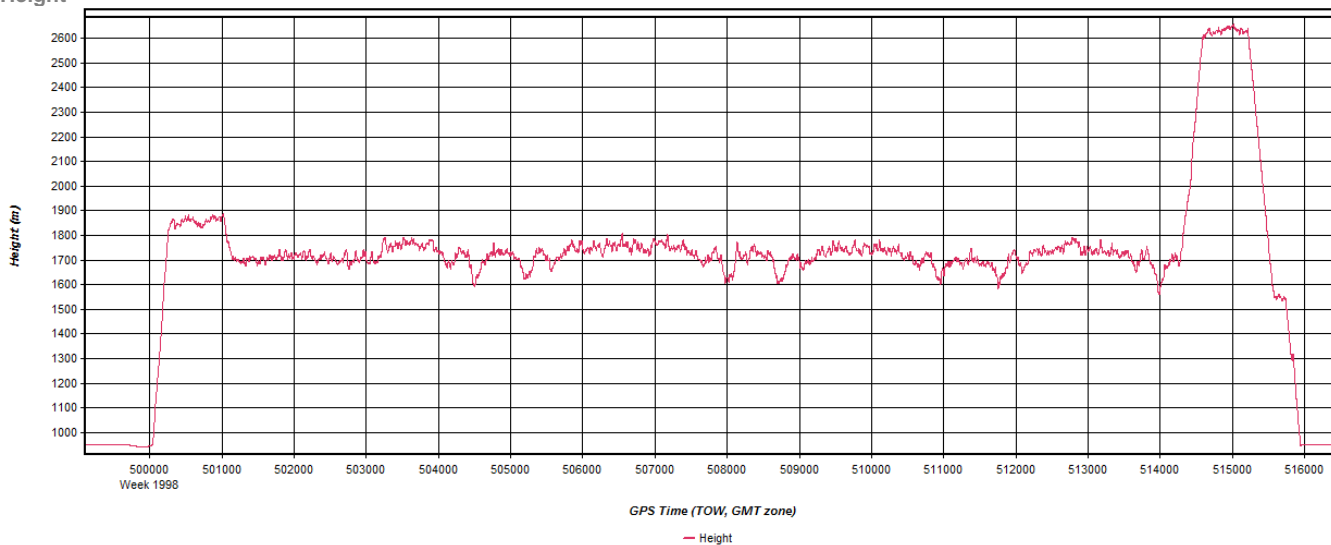




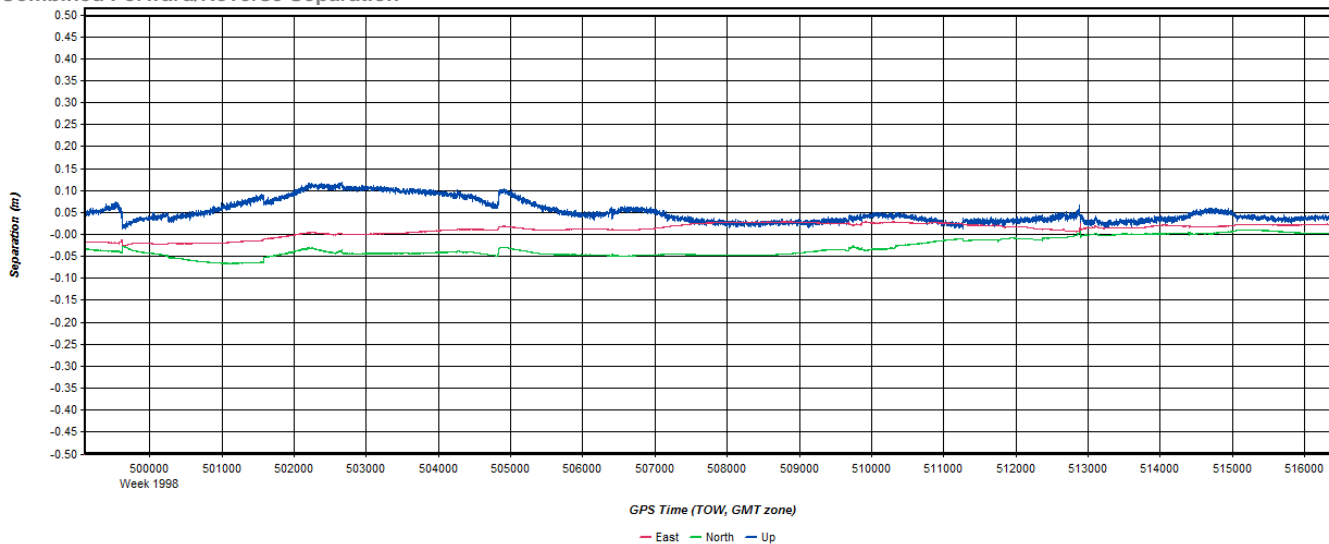
Quality Factor



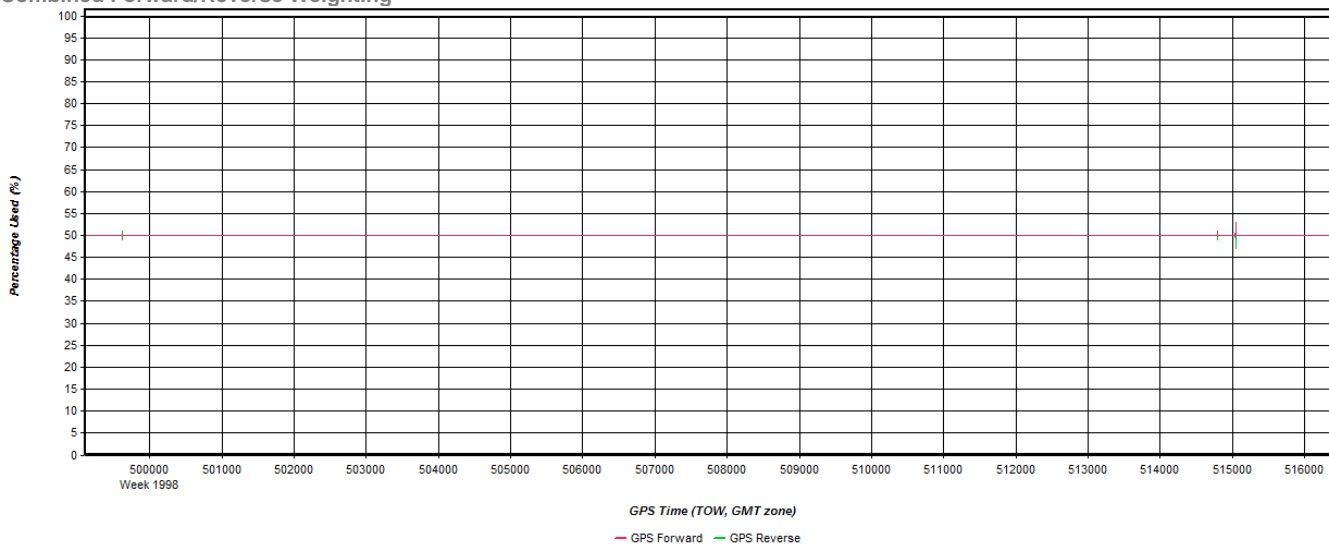
Height



Combined Forward/Reverse Separation

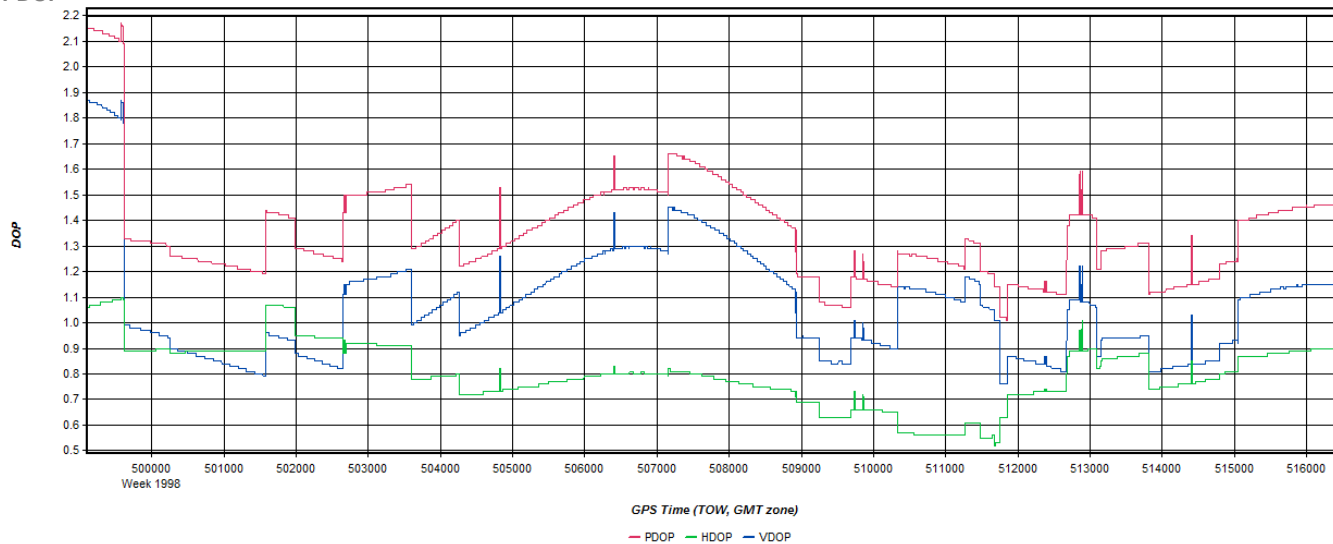


Combined Forward/Reverse Weighting

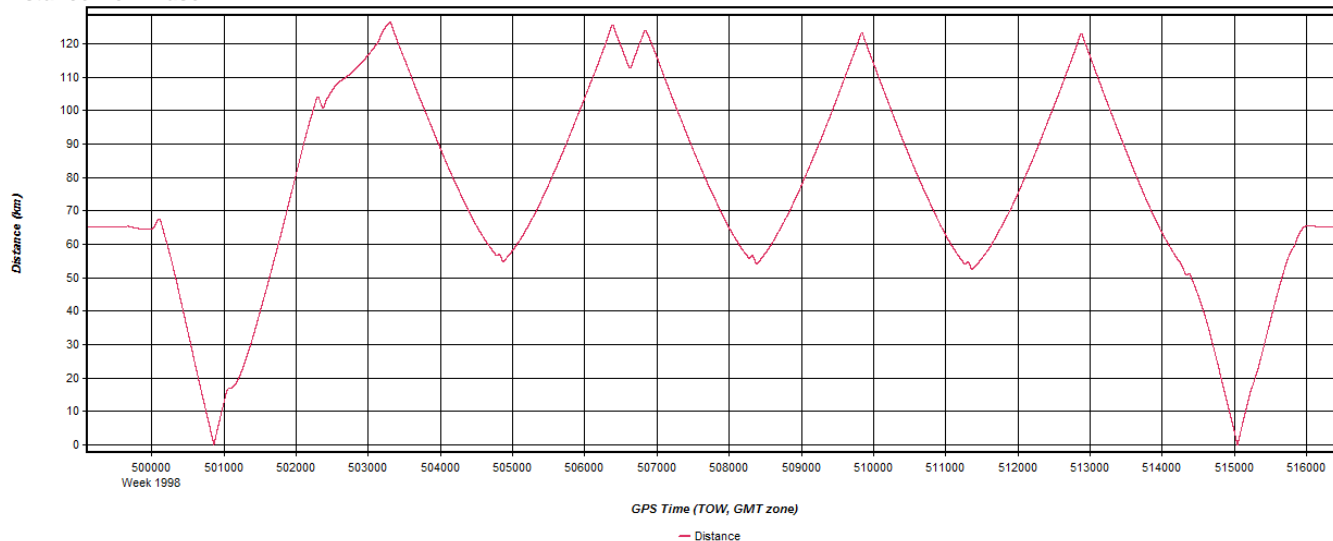




PDOP

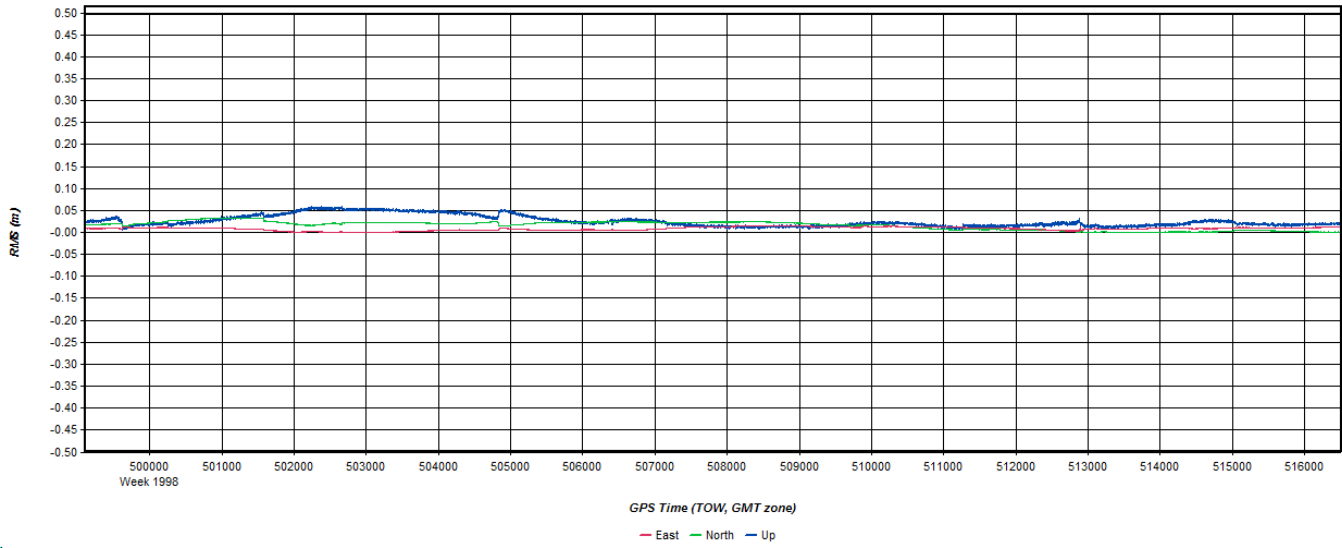


Distance from Base

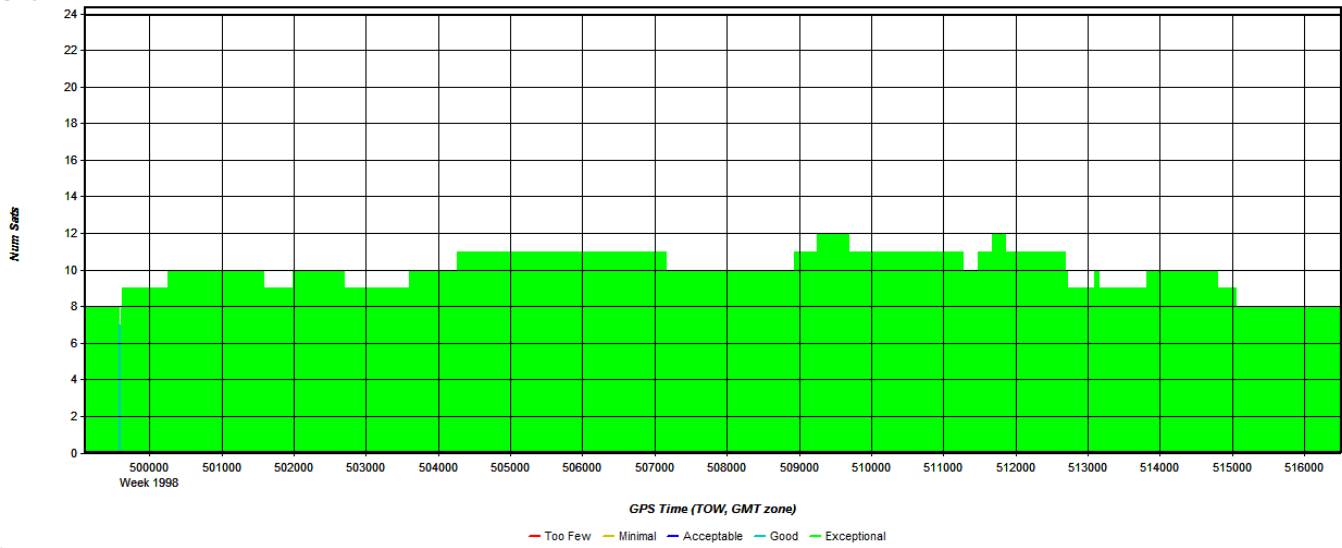


**USGS
COLLECTION REPORT**

Combined RMS



SVs



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COLLECTION REPORT**



Acquisition and Processing details ----- (April 28, 2018)

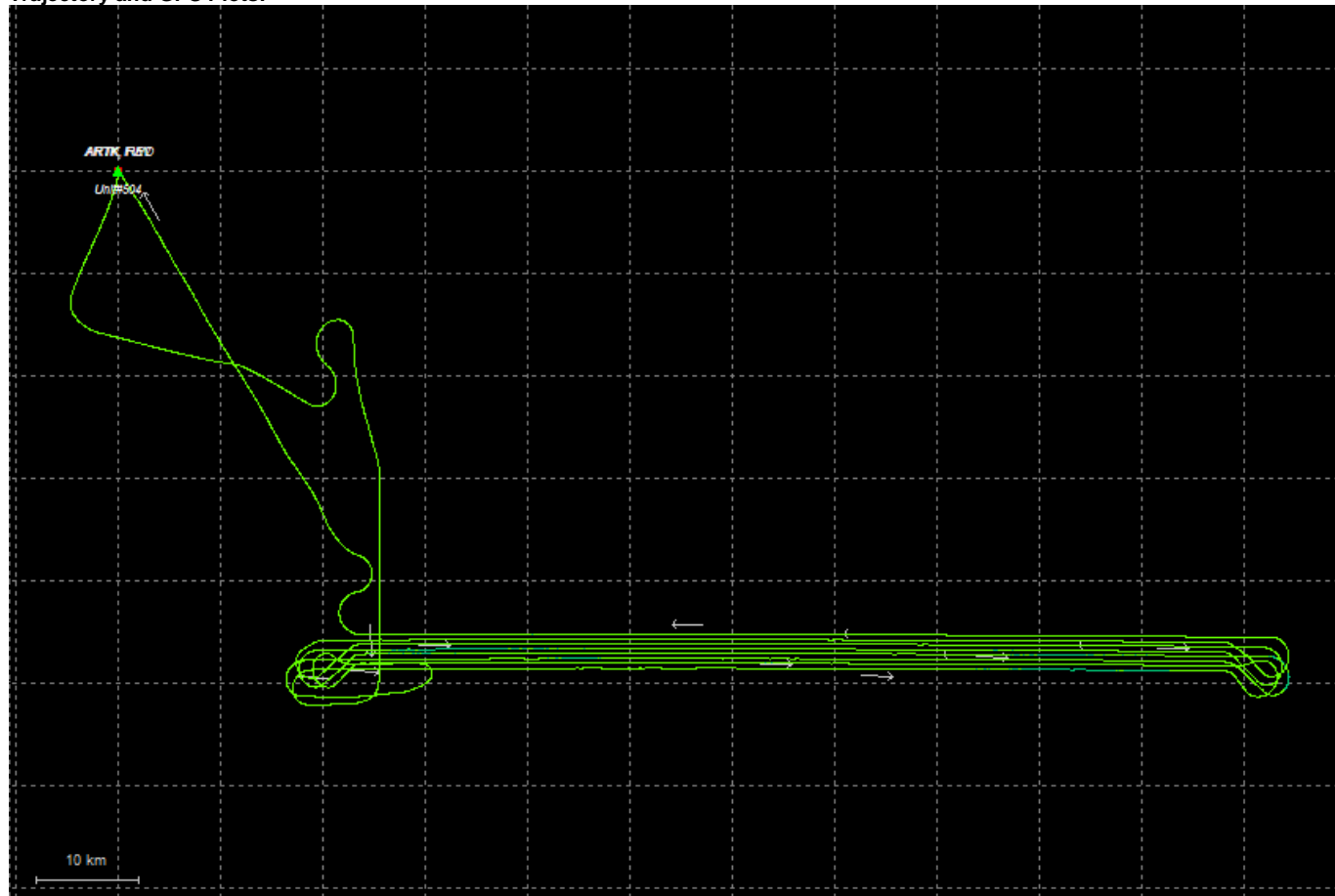
Log: 180428_165_33780055_10

18.01	Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	13:34	22.5	KRAP	18:42	27.2	5:08	5:25	4.7	0900-Production
2										
3										

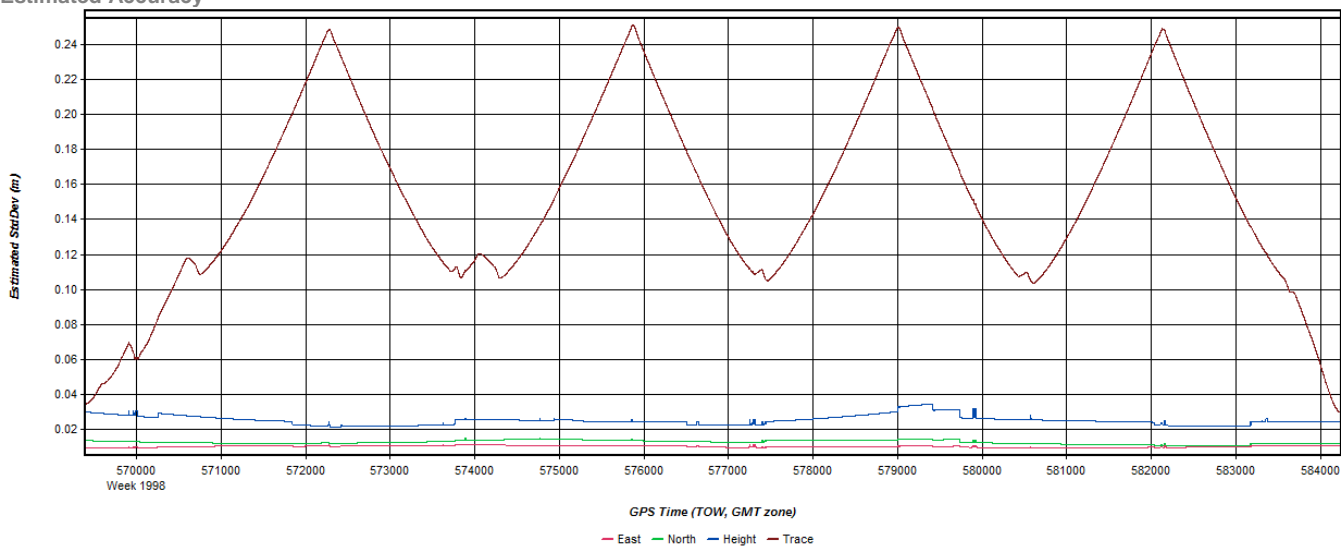
FUGRO		Fugro USA Land, Inc.		Riegl		Flight Log		AC80-50-00-02	
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FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU				Ground Temp °C 2.0 18.0	Min Range' 1542	Data Logger Drives 12				
Flight Date 28-Apr-18	GPS Day 18-118	Lift 10		Sun*	Solar Times (UTC)	Pulse Rate 330			Flying Temp °C 8.0 8.0	Max Range' 2933	Down load Drive				
Mission ID (yymmdd_Sen_Job_Lift) 180428_165_33780055_10		Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.06 29.97	Humidity @ Alt 75	Shipping Track	
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)	Stop Time (UTC)	GPS Filename	Operator Rob Nelson	Data					
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							13:39:00	13:44:00					ground static at KRAP	15	1.4
							14:06:52	14:12:01					overfly basestation	16	1.1
							14:17:48						s turn	16	1.3
13EX	2		30	15	12.8	6.2	14:24:36	14:29:11	S	5,450	125		cross tie line	16	1.3
13E	53		1	189	0	82.7	14:33:42	14:55:49	E	5,598	124			17	1.2
	52		189	1	82.7	0	14:59:19	15:21:24	W	5,745	125			18	1.0
	52		1	10	0	4	15:24:51	15:26:12	E	5,570	117		calibration line	16	1.1
	51		1	189	0	82.7	15:33:03	15:55:21	E	5,608	124			16	1.1
	50		189	1	82.7	0	15:59:28	16:21:11	W	5,754	127			16	1.2
	49		1	189	0	82.7	16:25:24	16:47:41	E	5,555	122			18	1.1
	48		189	1	82.7	0	16:51:33	17:13:17	W	5,758	119			17	1.2
	47		1	189	0	82.7	17:17:52	17:39:46	E	5,566	117			17	1.3
	46		189	1	82.7	0	17:43:54	18:05:42	W	5,694	126			19	1.1
							18:05:50						s turn	17	1.2
							18:14:40	18:19:40					overfly basestation	19	1.0
							18:35:00	18:40:00					ground static at KRAP	14	1.6

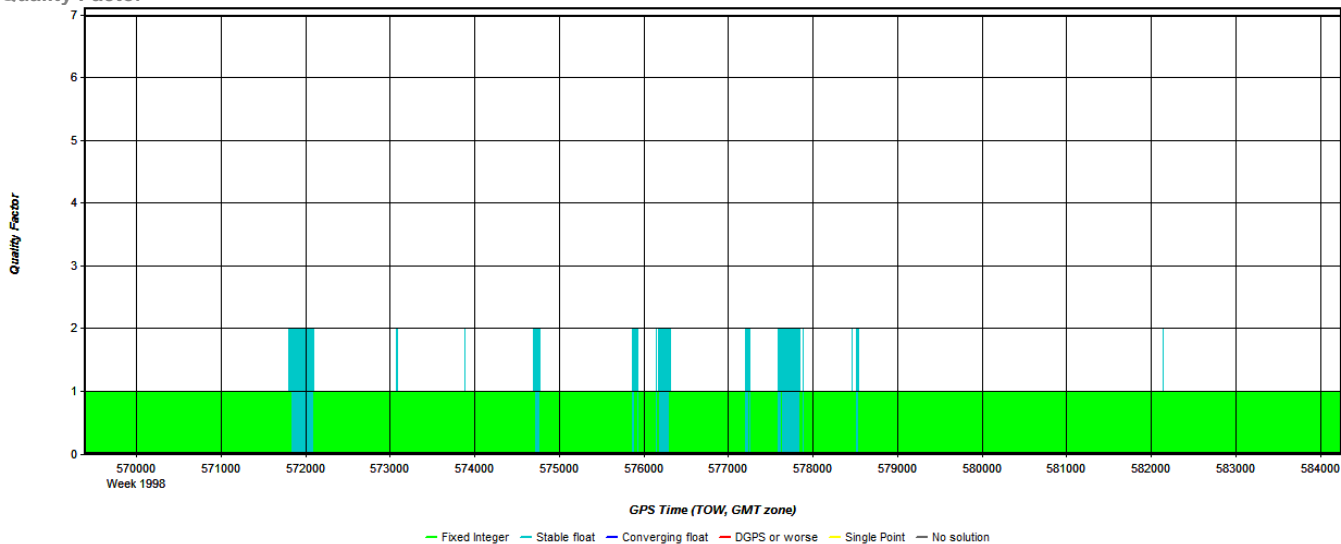
Trajectory and GPS Plots:



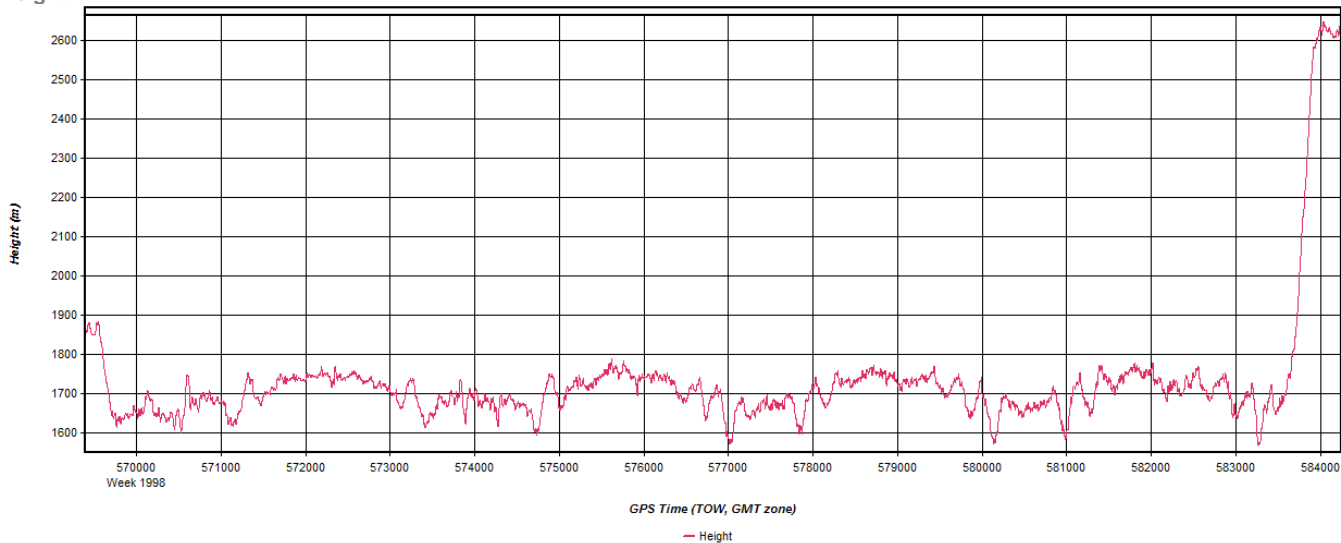
Estimated Accuracy



Quality Factor

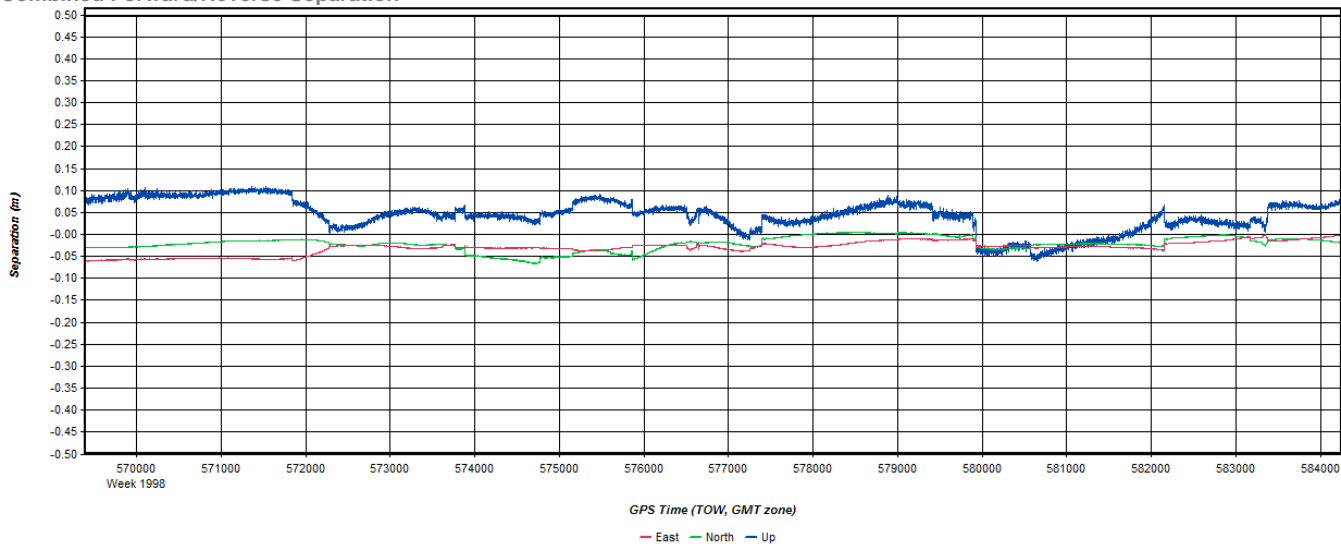


Height

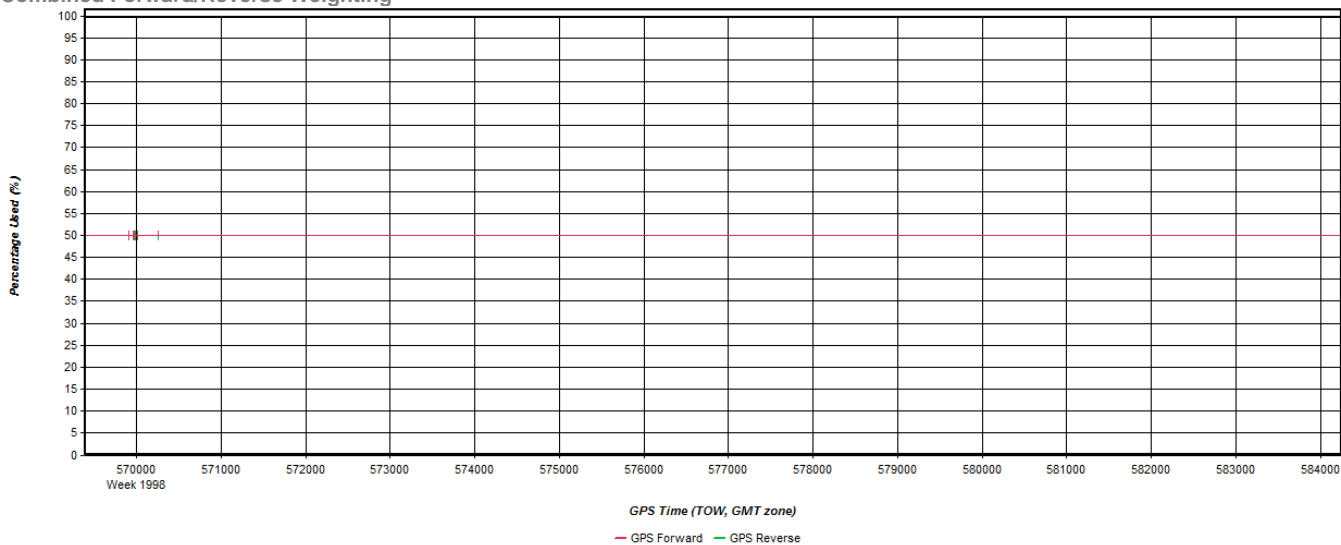




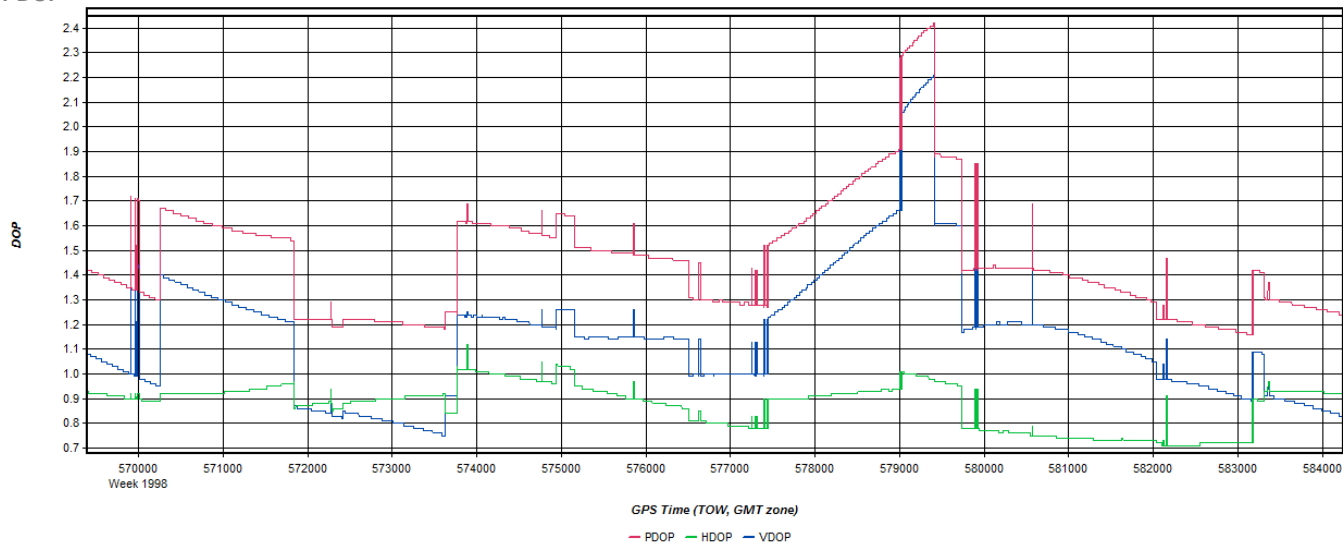
Combined Forward/Reverse Separation



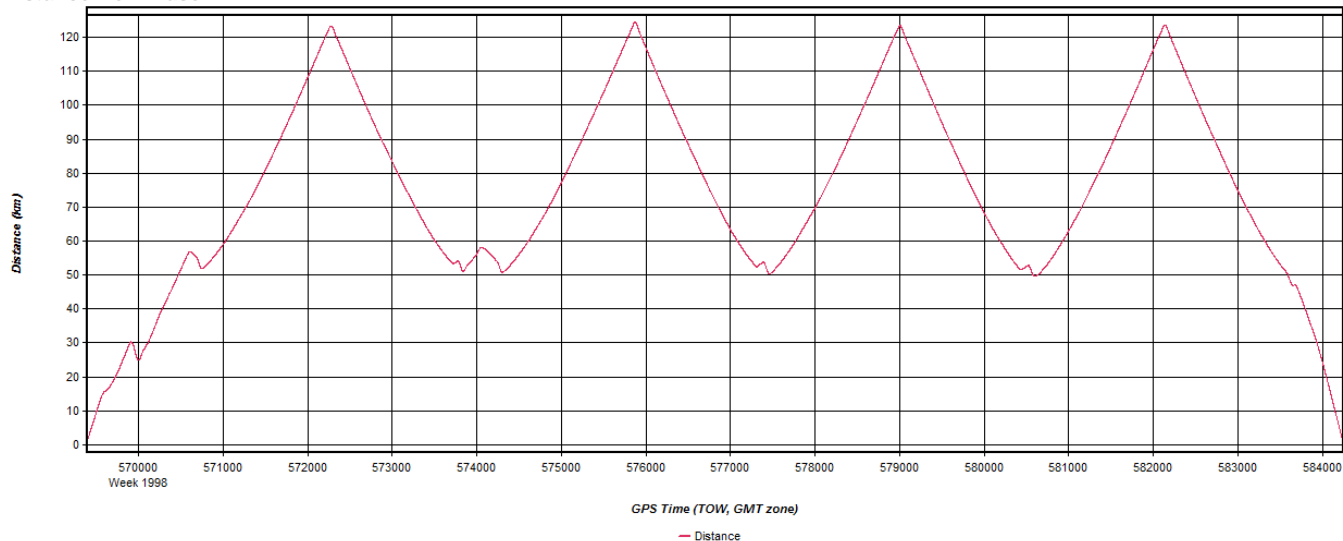
Combined Forward/Reverse Weighting



PDOP

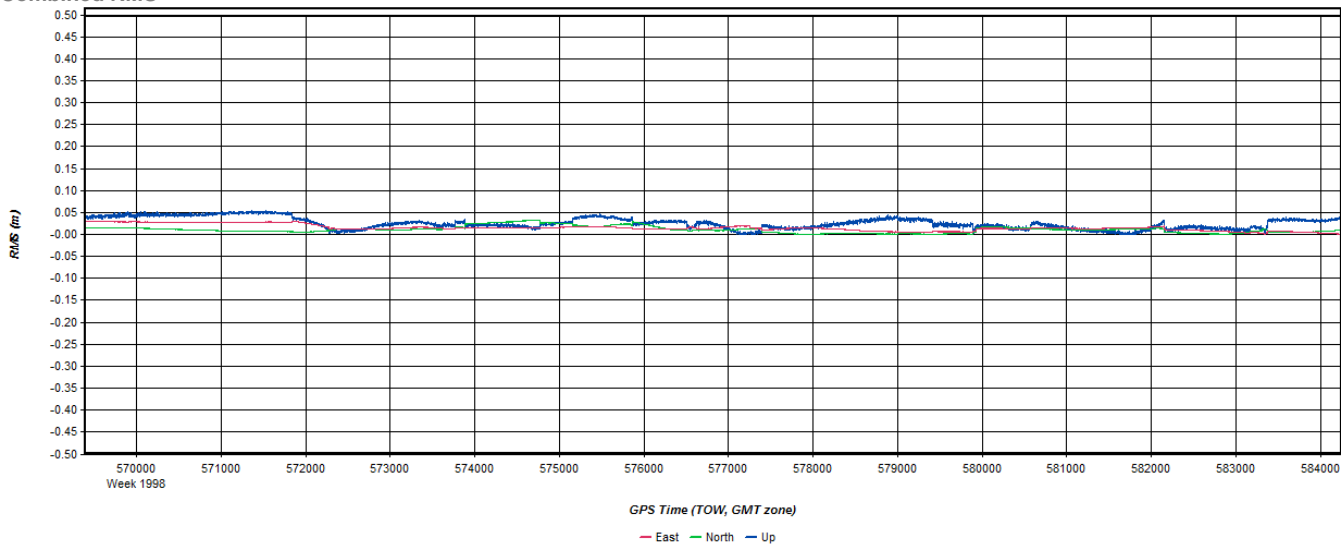


Distance from Base

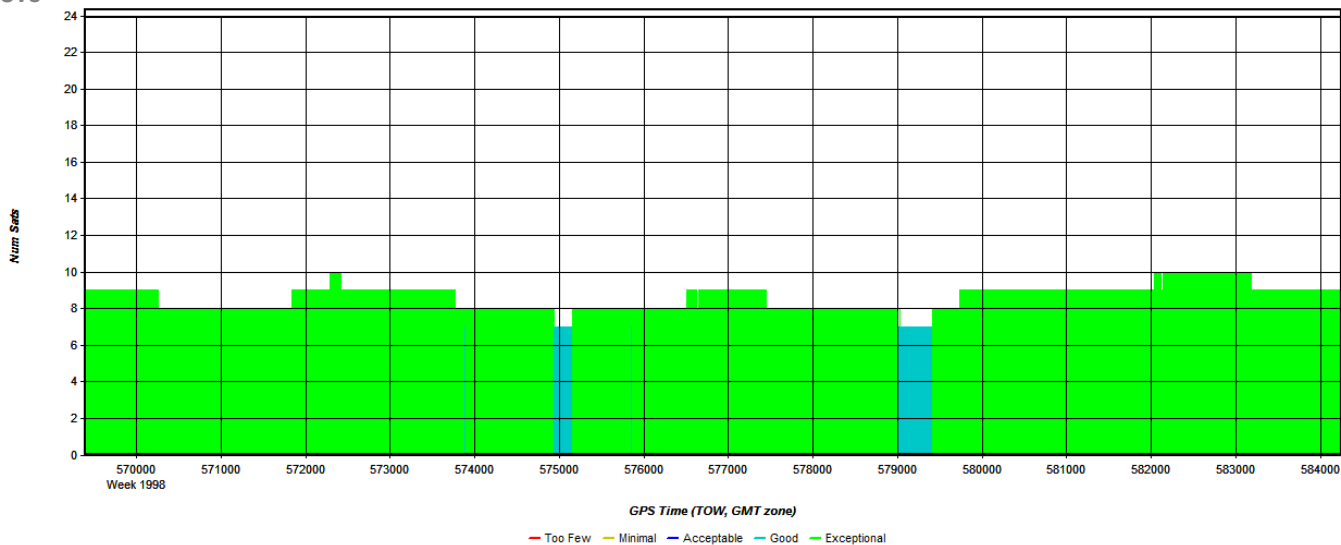




Combined RMS



SVs



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COLLECTION REPORT**



Acquisition and Processing details ----- (April 29, 2018)

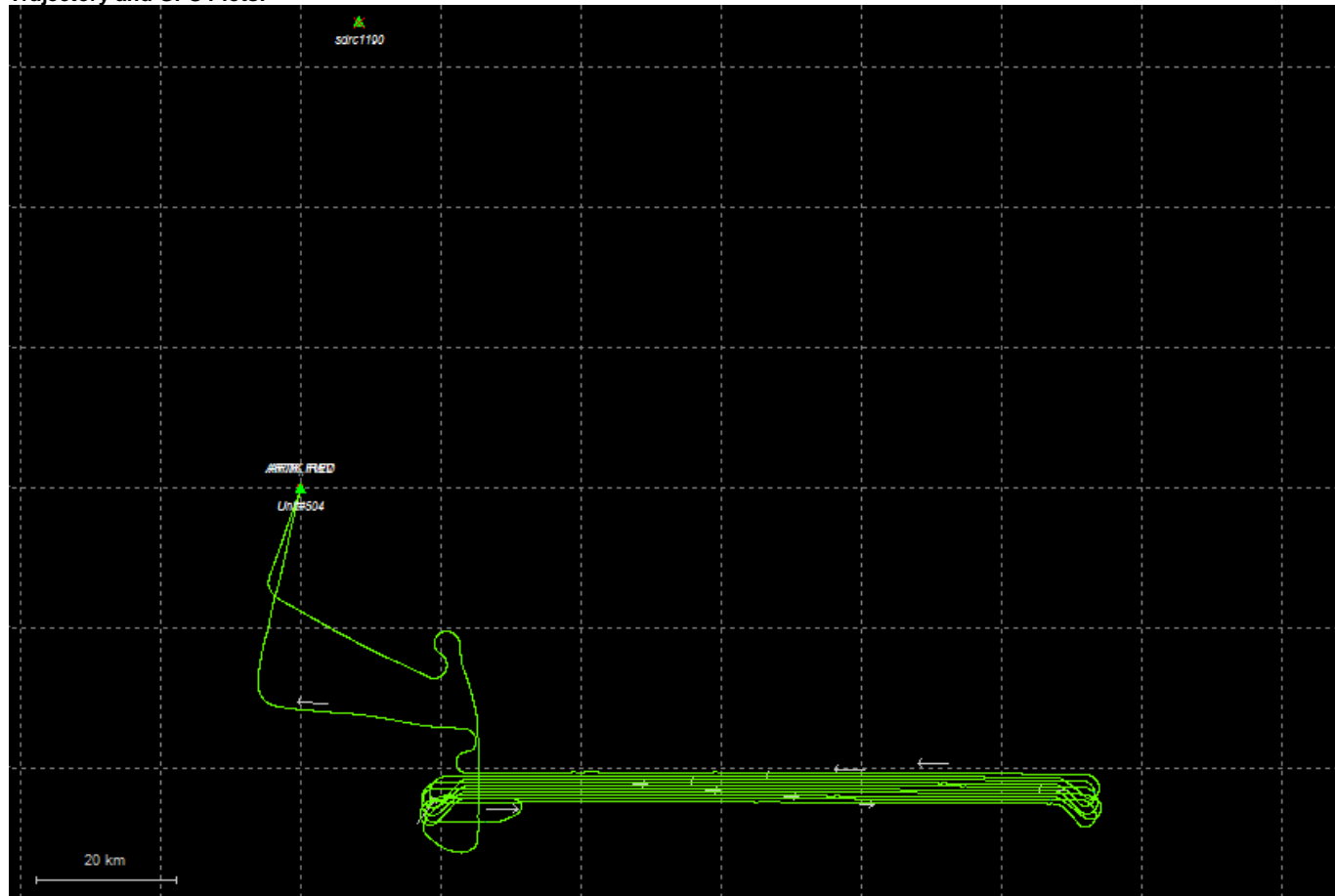
Log: 180429_165_33780055_11

FUGRO	Fugro USA Land, Inc.	18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
			Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
			1	KRAP	14:08	1027.2	KRAP	20:12	1032.7	6:04	6.00	5.5
2												
3												

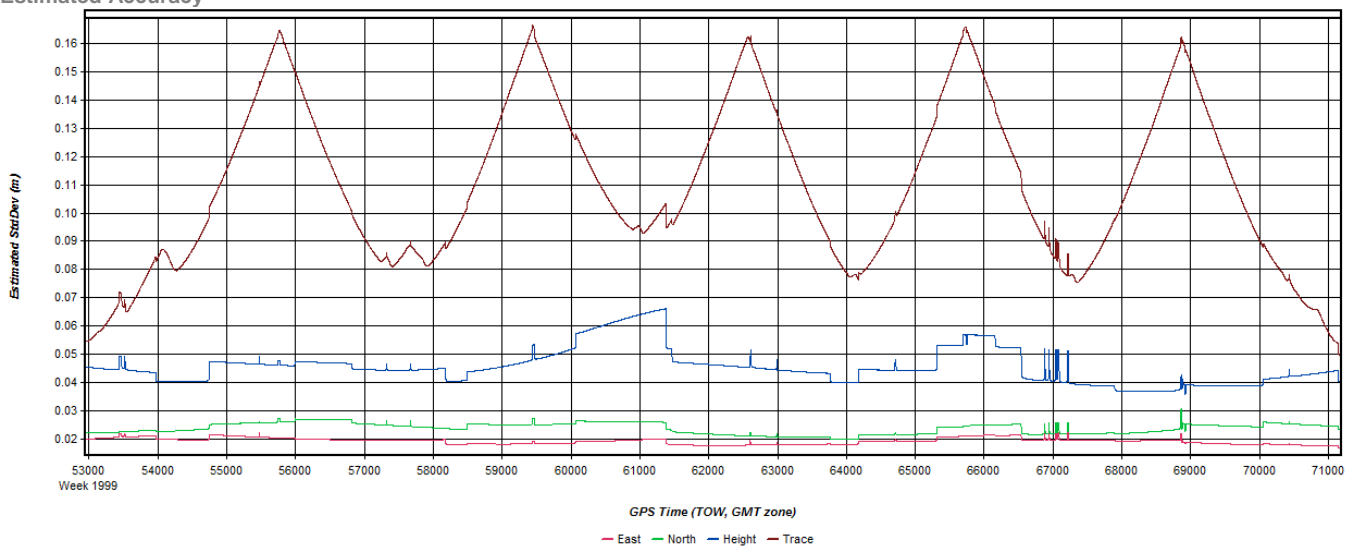
FGI Job # 33780055		Project Name SD USGS FY18		System 680i	Unit 165	IMU FMU-300			Ground Temp °C 12.0 26.0	Min Range' 1542	Data Logger Drives DR680-14 & 4					
Flight Date 29-Apr-18	GPS Day 18-119	Lift 11			Sun° N/A	Solar Times (UTC) N/A	Pulse Rate 330	Flying Temp °C 12.0 14.0		Max Range' 2933	Download Drive					
Mission ID (yyymmdd_Sen_Job_Lift) 180429_165_33780055_11		Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 29.69 29.60	Humidity @ Alt 63%	Shipping Track		
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Eric Mueller		Operator #2										
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator Jason Flynn	Data			
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP	
	FGI	Client	From	To	Begin	End	Start	End								
							14:15:00	14:18:00					GROUND-STATIC @KRAP	14	1.4	
							14:39:00	14:44:00		6,089	160		OVERFLY BASESTATION #7002	18	1.0	
							14:50:00	14:53:00		5,330	145		PRE ACQUISITION CALIBRATION	17	1.1	
RGL_3EX	2		40	20	17.2	8.4	14:57:00	14:59:00	180	5,340	126		CROSS LINE	18	1.0	
RGL_3_E	45		1	189	0	82.7	15:05:00	15:27:00	090	5,540	124			16	1.2	
			44		189	1	82.7	0	15:31:00	15:53:00	270	5,640	118		17	1.0
			44		1	10	0	4	15:57:00	15:59:00	090	5,640	124	CALIBRATION LINE	17	1.1
			43		1	189	0	82.7	16:06:00	16:28:00	090	5,640	122		17	1.1
			42		189	1	82.7	0	16:32:00	16:54:00	270	5,590	122		17	1.2
			41		1	189	0	82.7	16:58:00	17:20:00	090	5,440	125		16	1.3
			40		189	1	82.7	0	17:24:00	17:46:00	270	5,440	120		18	1.1
			39		1	189	0	82.7	17:51:00	18:13:00	090	5,440	129		19	1.1
			38		189	1	82.7	0	18:17:00	18:39:00	270	5,440	120		19	1.1
			37		1	189	0	82.7	18:43:00	19:05:00	090	5,440	128		18	1.2
			36		189	1	82.7	0	19:09:00	19:31:00	270	5,440	124		19	1.1
							19:32:00	19:34:00		5,500	125		POST ACQUISITION CALIBRATION	18	1.1	
							19:43:00	19:48:00		6,040	176		OVERFLY BASESTATION #7002	18	1.1	
							20:06:00	20:09:00					GROUND-STATIC @KRAP	18	1.2	

**Riegl
Flight Log
AC80-50-00-02**

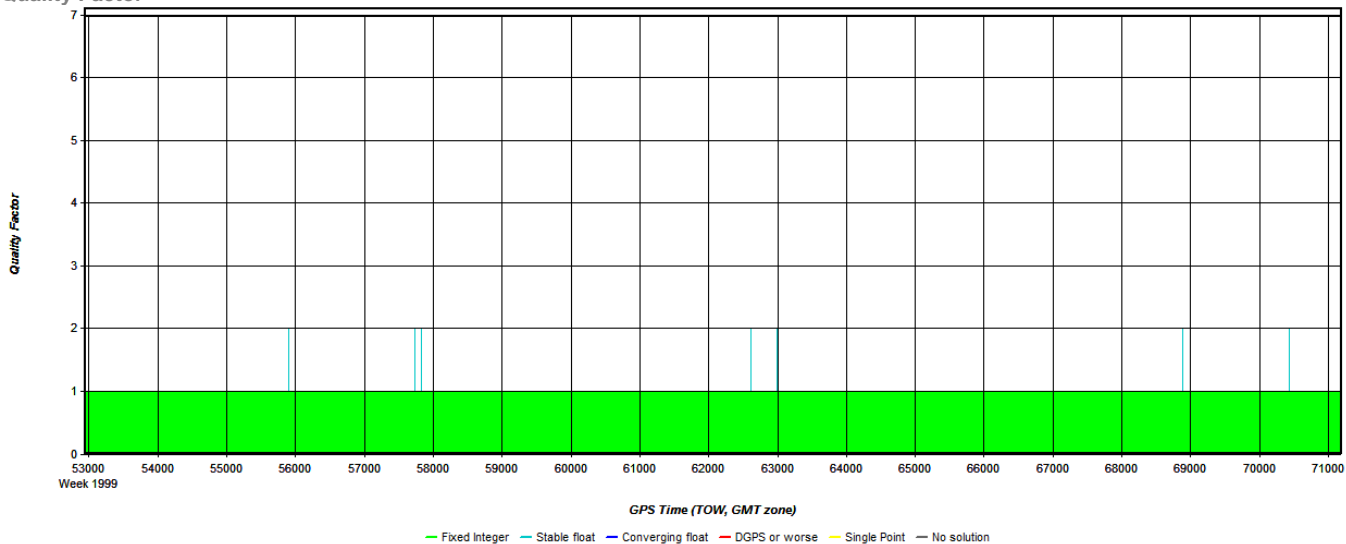
Trajectory and GPS Plots:



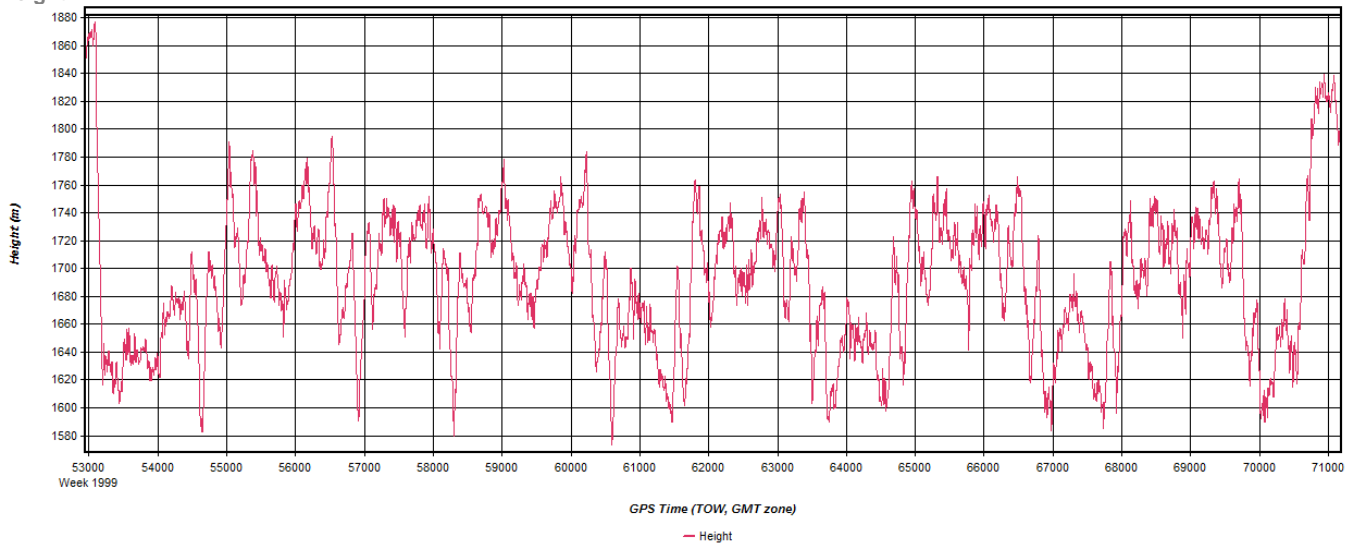
Estimated Accuracy



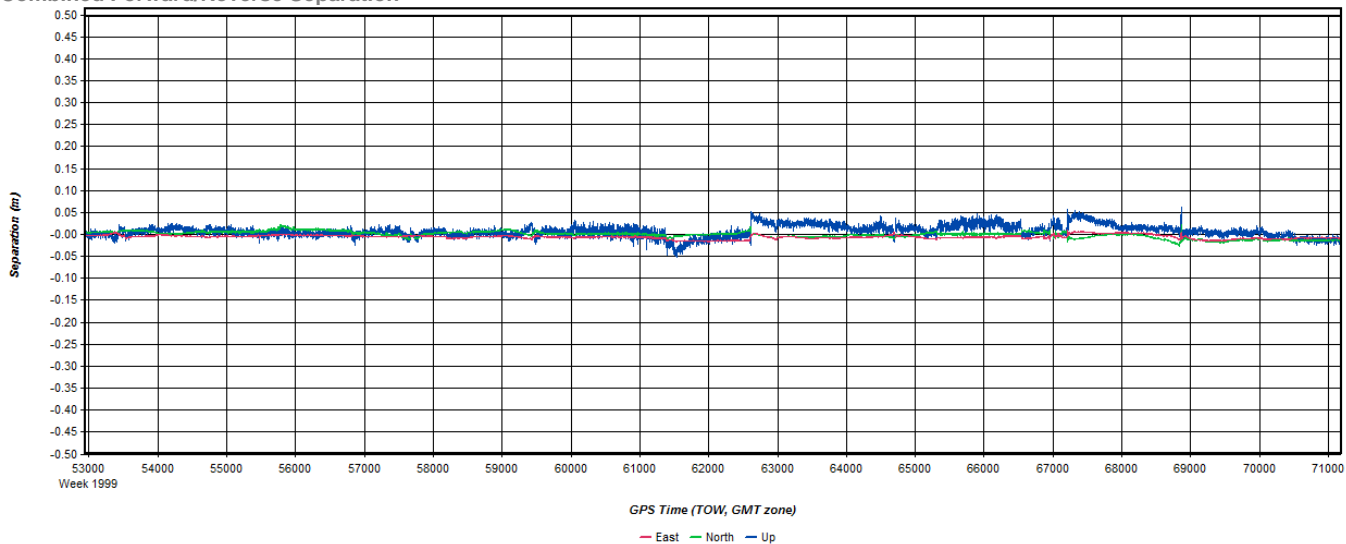
Quality Factor



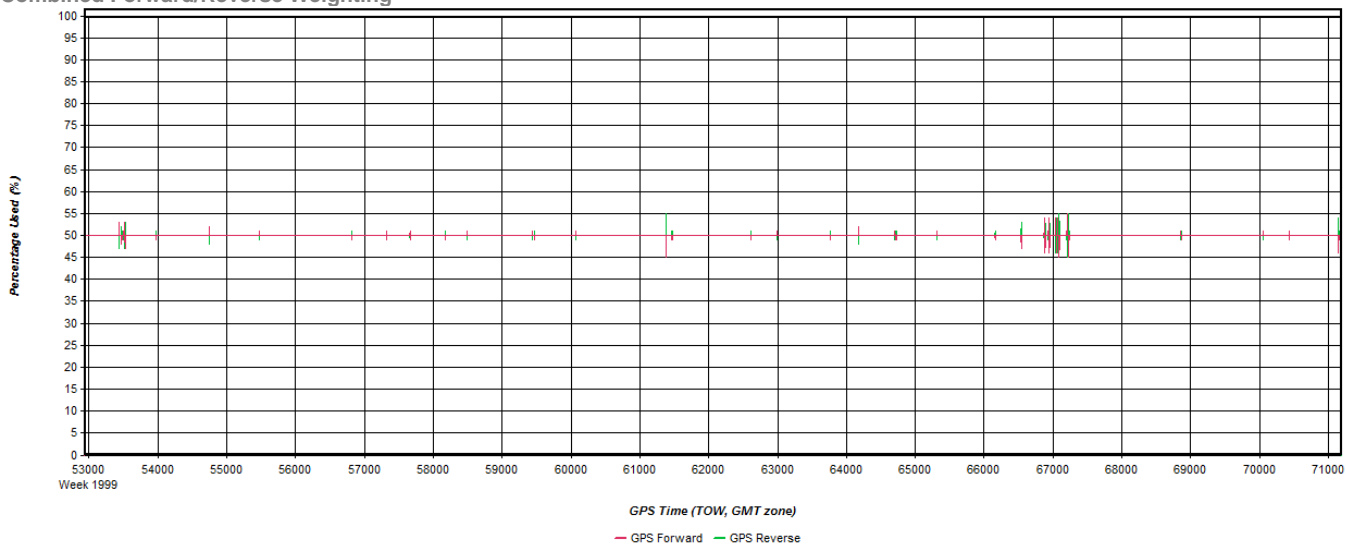
Height



Combined Forward/Reverse Separation

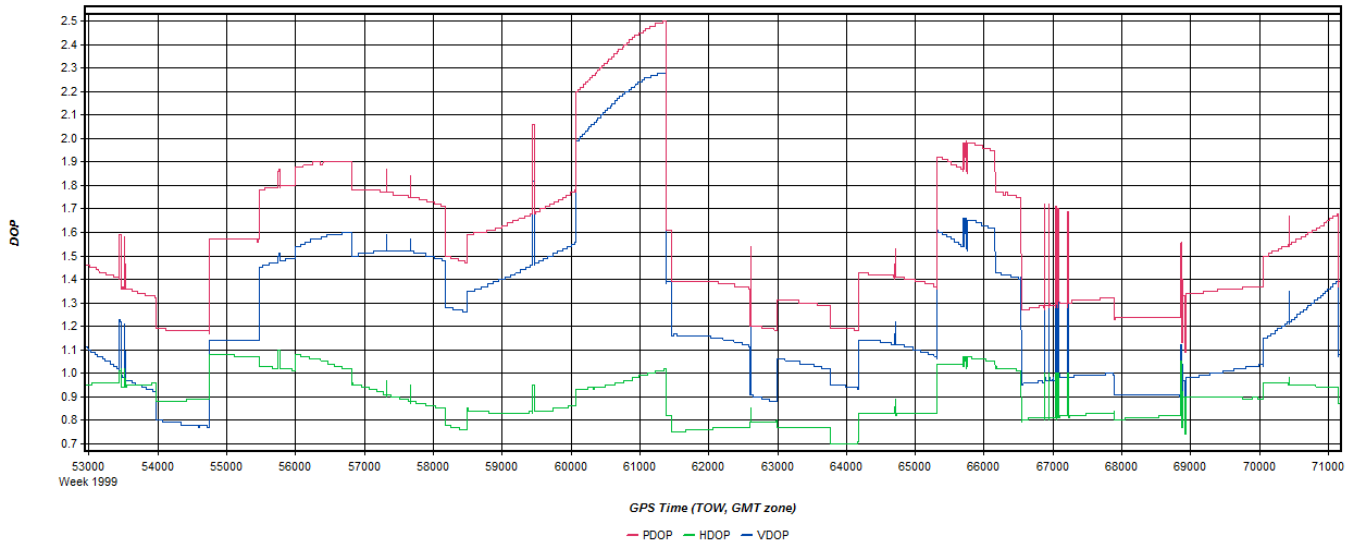


Combined Forward/Reverse Weighting

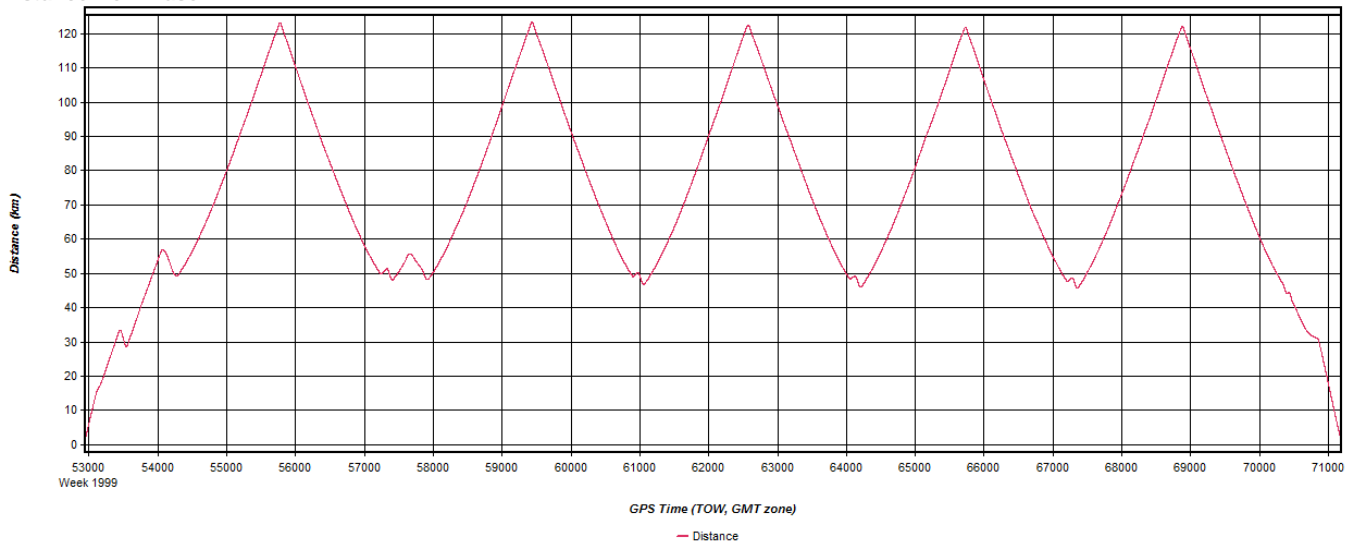


USGS COLLECTION REPORT

PDOP

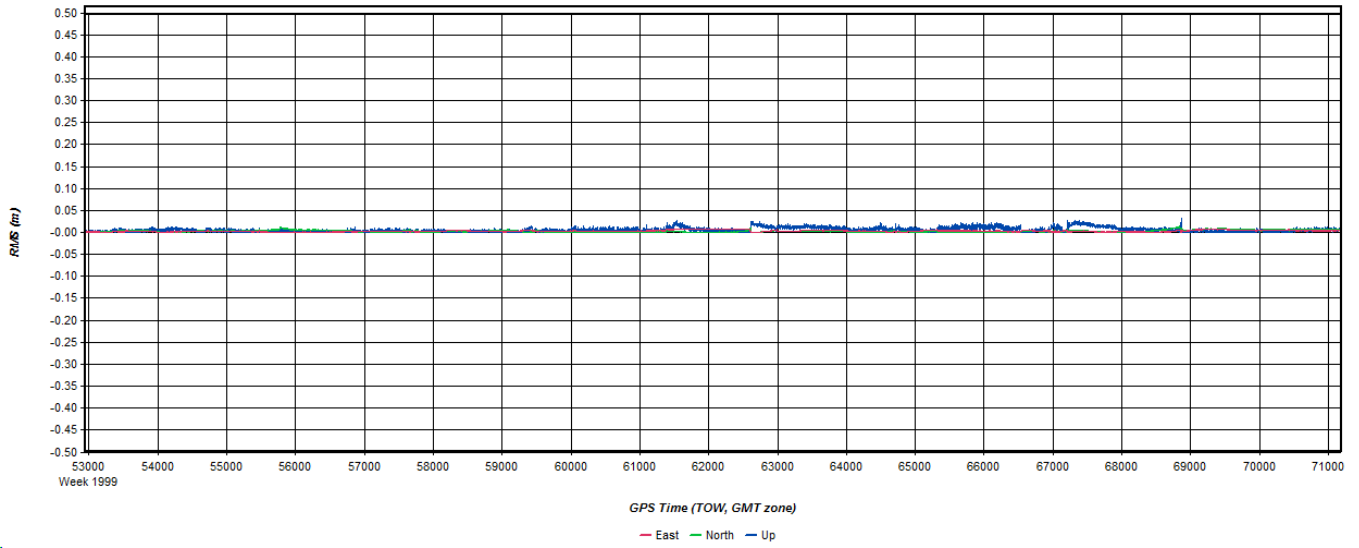


Distance from Base

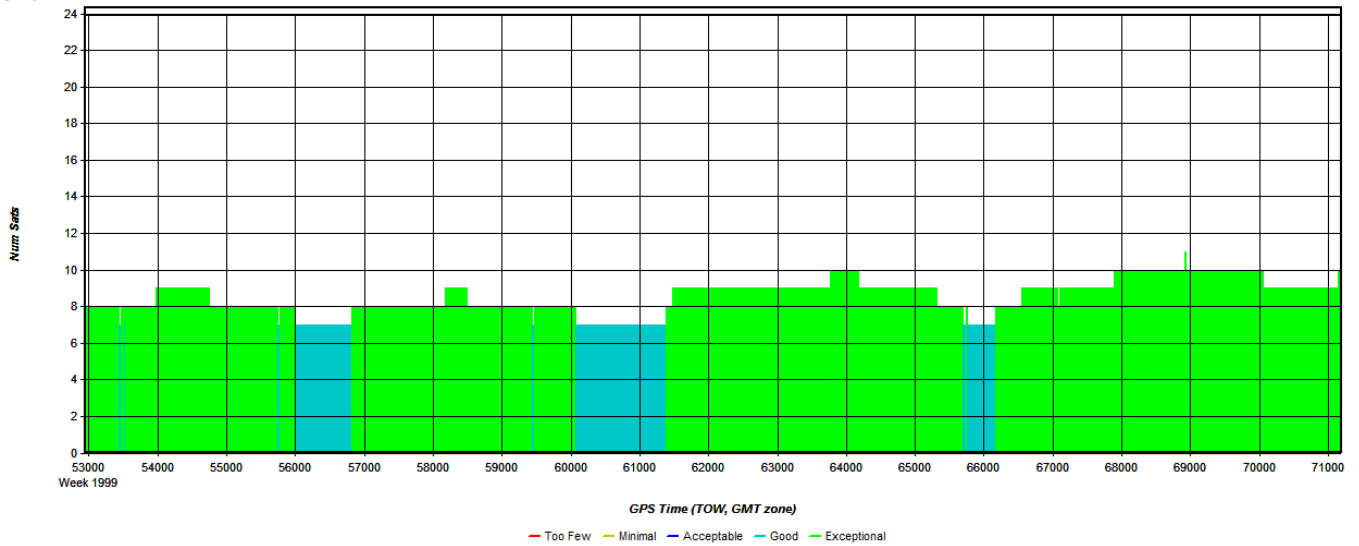


**USGS
COLLECTION REPORT**

Combined RMS



SVs



**USGS
COLLECTION REPORT**



Acquisition and Processing details ----- (May 4, 2018)

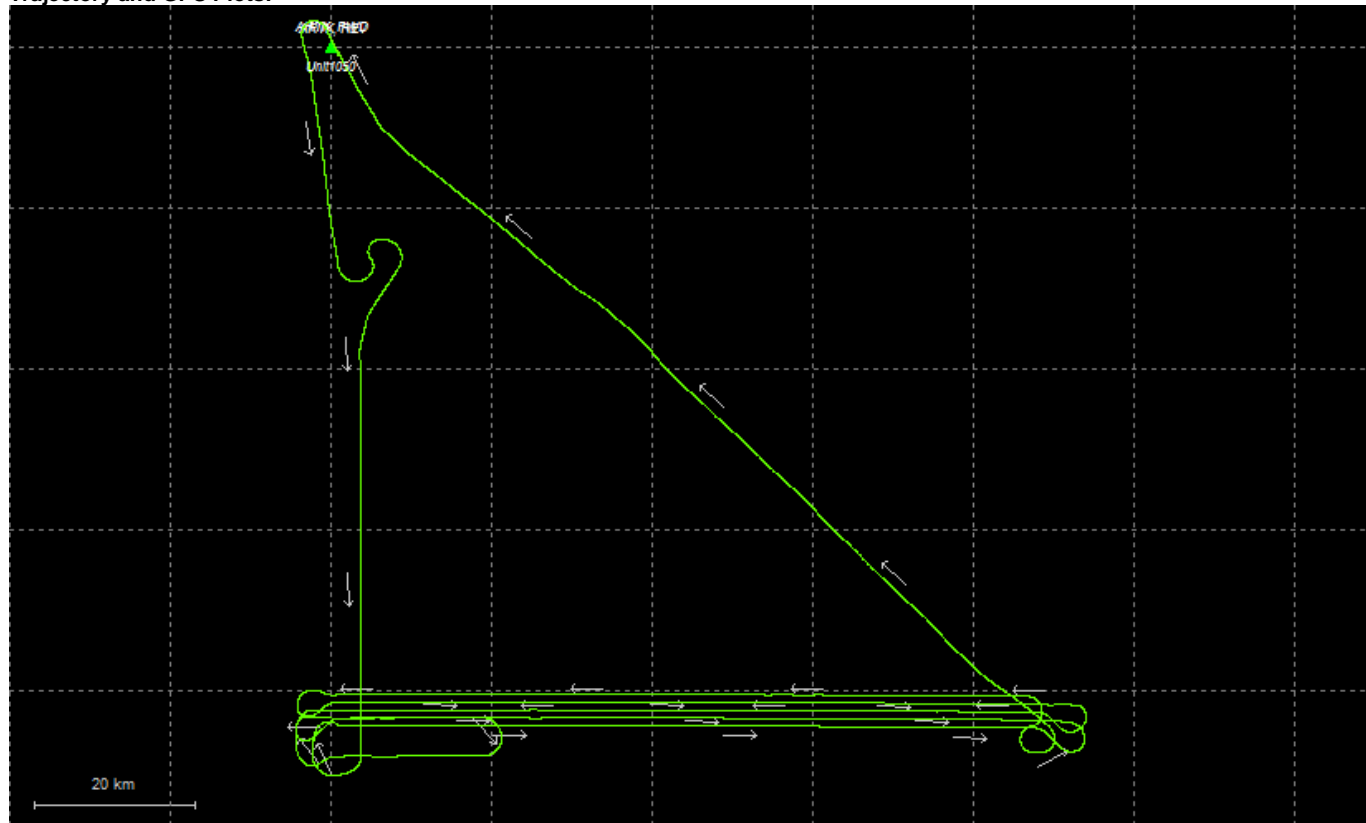
Log: 180504_118_33780055_01

18.012		Lift Begin			Lift End			Flt Duration	Flt Hrs	Hobbs Hrs	Activity
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	13:57	1051.5	KRAP	17:32	1055.1	3:34	3.50	3.6	0900-Production	
2											
3											

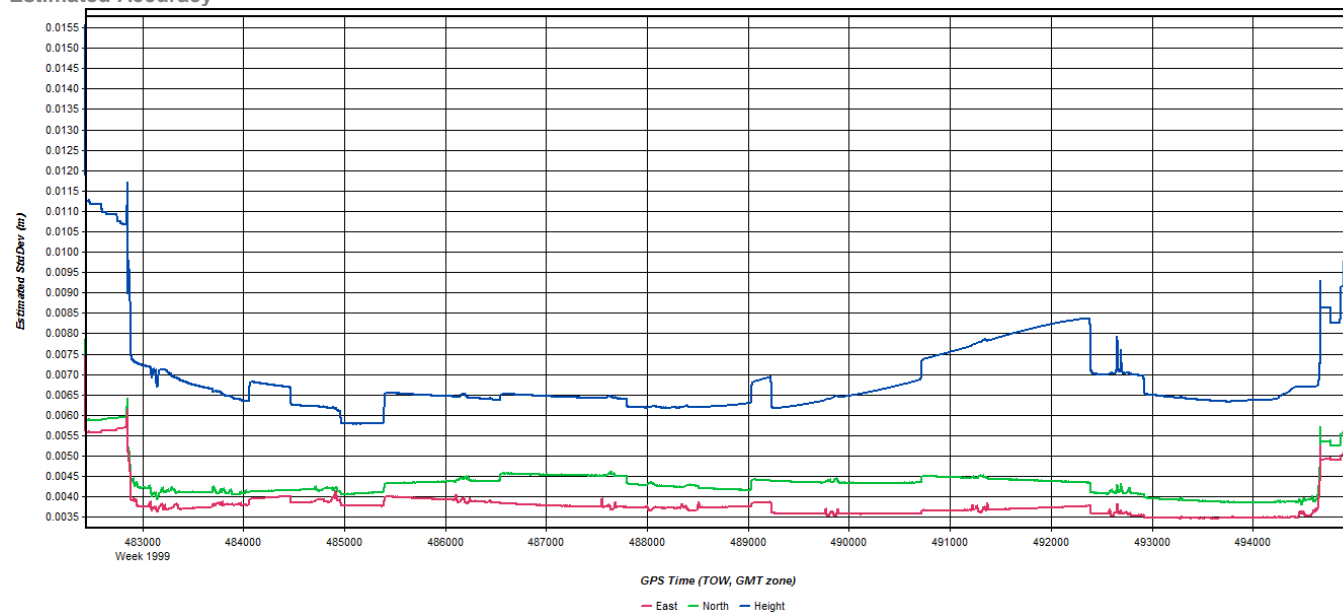
FUGRO		Fugro USA Land, Inc.											ALS
												Flight Log	
												AC80-44-00-02	

FGI Job # 04.33780055	Project Name USGS FY18			System ALS80	Unit 118	IMU uRS	PIA 5	SW1	SW2-Gain	AutoScan Yes	Ground Temp °C 15.0 23.0	Min Range Gate 8020	Data Logger Drive MM70-05		
Flight Date 4-May-18	GPS Day 18-124	Lift 1		Sun° NA	Solar Times (UTC) NA	Laser Power 100%	Pattern Triangle	Flying Temp °C -6.0 -6.0	Max Range Gate 9147	Download Drive NS1TB-112	Shipping Track 4330 3843 8777				
Mission ID (yymmdd_Sen_Job_Lift) 180504_118_33780055_01	Aircraft N62912	Airport ID KRAP	FMS CCNS 8	UTC 8,700	AMT (ft) 150	Speed 55.0	Scan Hz 5,342	FOV 27	kmWPT 1.595	Altm Setting 30.13 30.11					
Pilot #1 Fred Davis		Pilot #2		Operator #1 Jonathan Spencer		Operator #2									
Base 1 ID FGI 081	Location KRAP		Rec ID GR3	Ant ID U1	ARP (m) 1.8	Start Time (UTC) 04-May-18 13:10	Stop Time (UTC) 04-May-18 17:43	GPS Filename Unit10504n.tps	Operator Jonathan Spencer	Data Shipped					
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End							
							14:01:37	14:06:37					5 min grd stc	14	1.6
							14:21:16	14:24:05					S-turn	19	1.1
ALS13X	7		22	1	33.5	0	14:29:56	14:37:42	S	11590	143	55.0	crossing line	18	1.1
ALS13D	33		1	53	0	82.9	14:42:00	15:00:58	E	11690	143	55.0	smoke layer observed	17	1.2
	32		53	1	82.9	0	15:05:25	15:25:05	W	11690	137	55.0		16	1.3
	32		1	10	0	14.4	15:29:09	15:32:40	E	11690	142	55.0	calibration line	18	1.2
	31		1	53	0	82.9	15:42:52	16:01:50	E	11690	143	55.0		19	1.2
	30		53	1	82.9	0	16:06:17	16:26:03	W	11690	135	55.0		18	1.3
	29		1	53	0	82.9	16:29:50	16:48:59	E	11690	142	55.0		21	1.4
							16:49:18	16:51:44					S-turn	21	1.3
							17:24:14	17:29:14					5 min grd stc	23	1.2

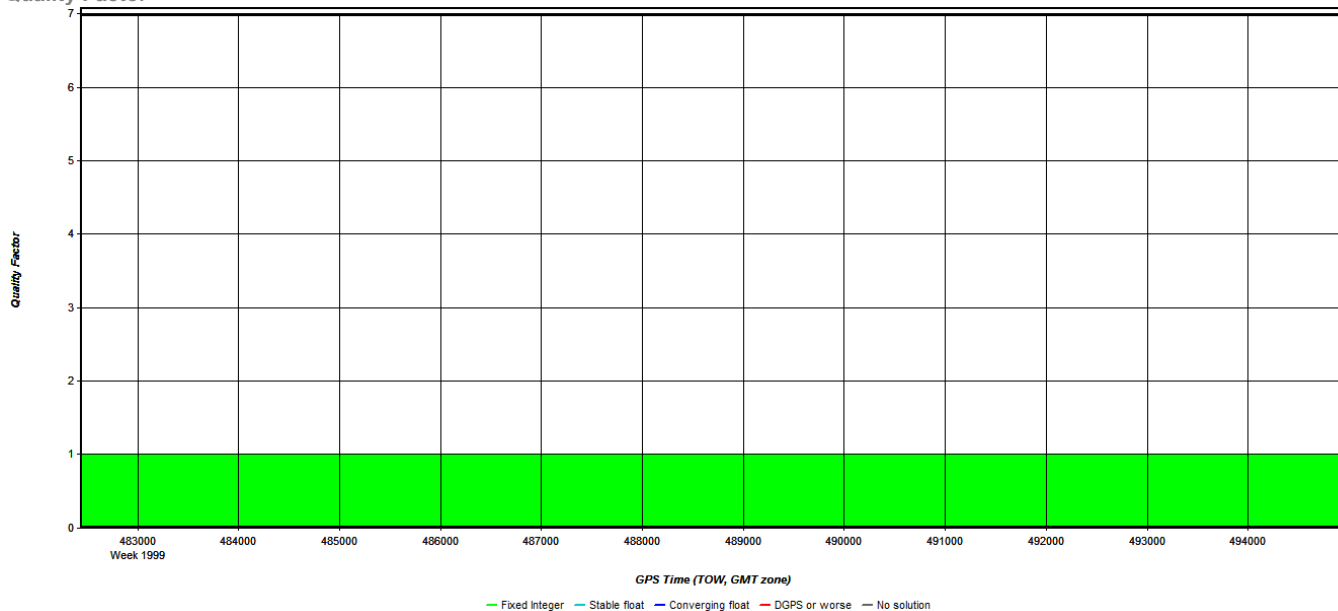
Trajectory and GPS Plots:



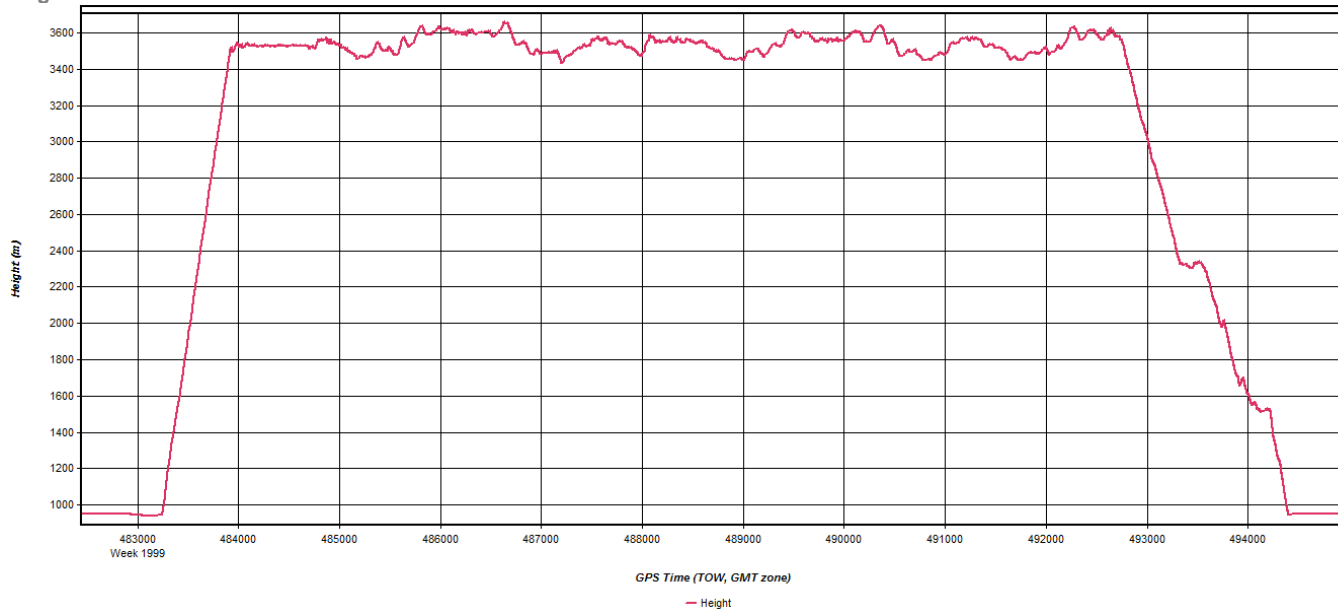
Estimated Accuracy



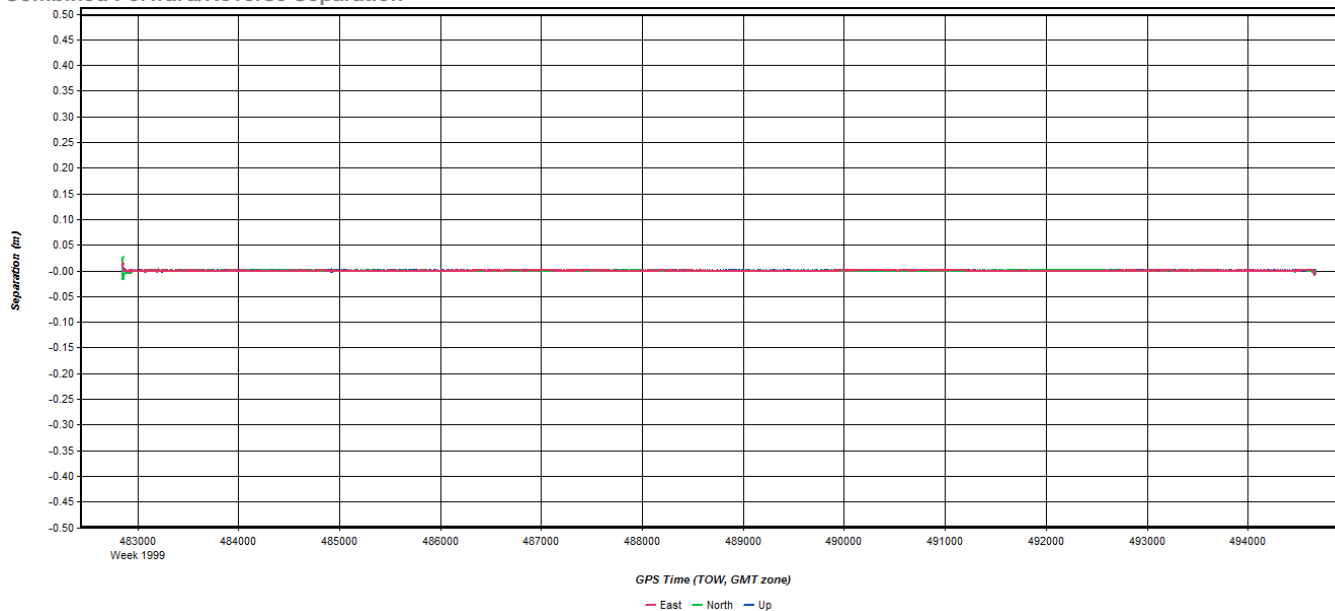
Quality Factor



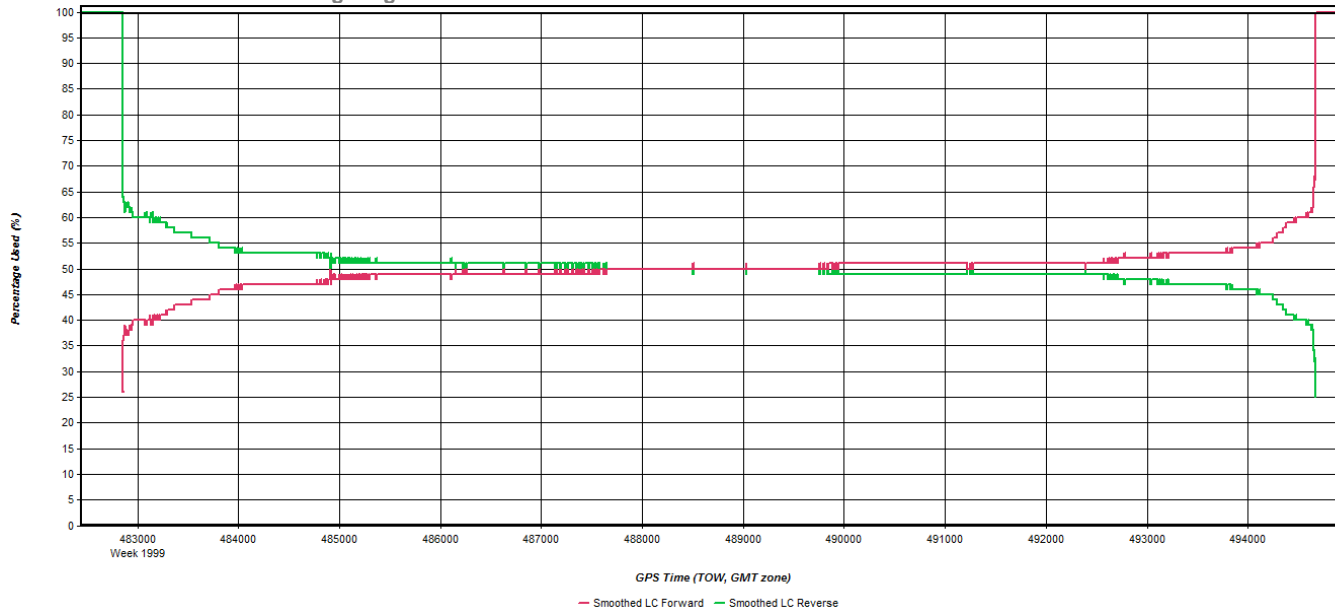
Height



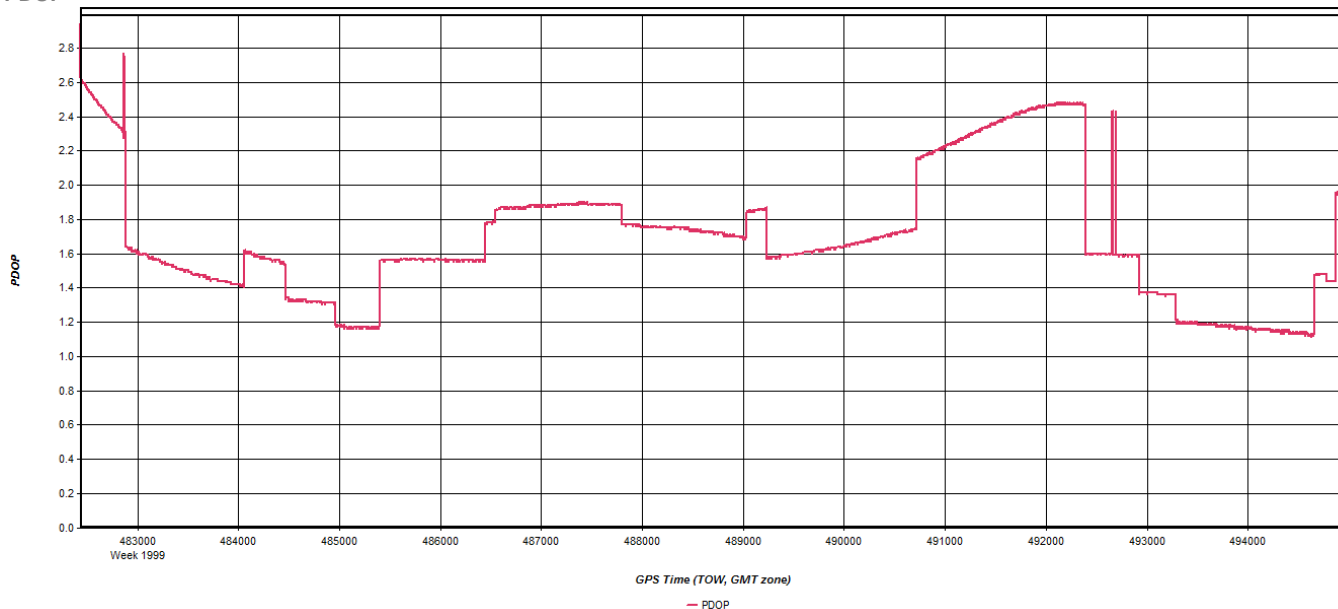
Combined Forward/Reverse Separation



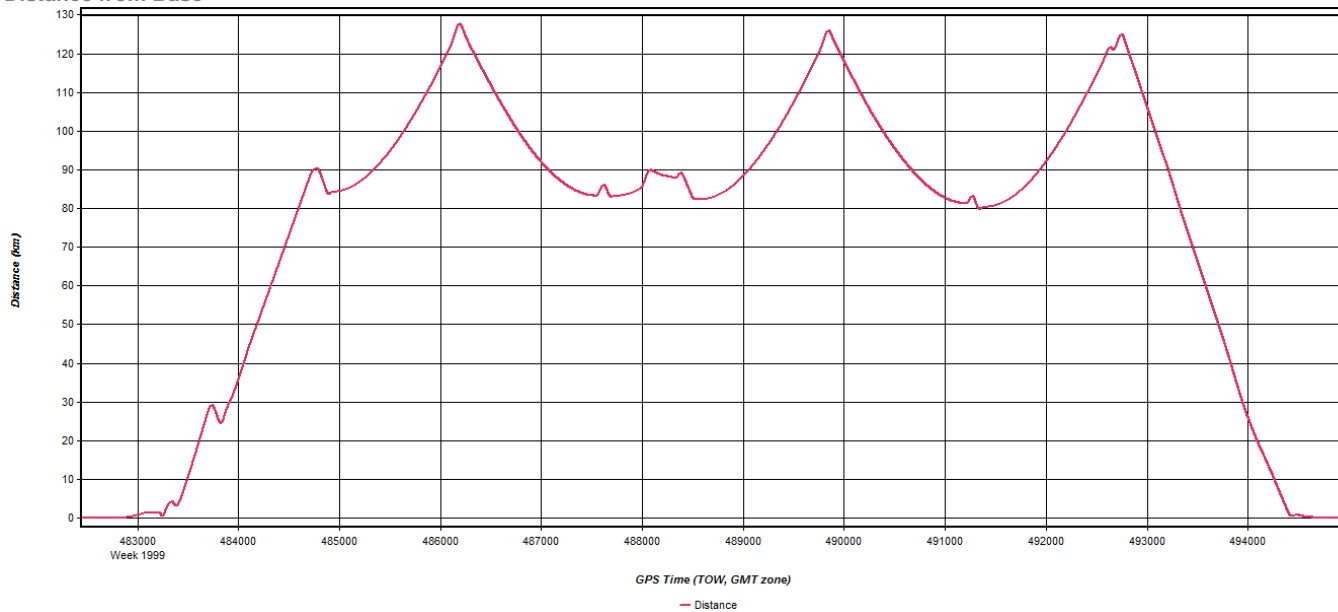
Combined Forward/Reverse Weighting



PDOP

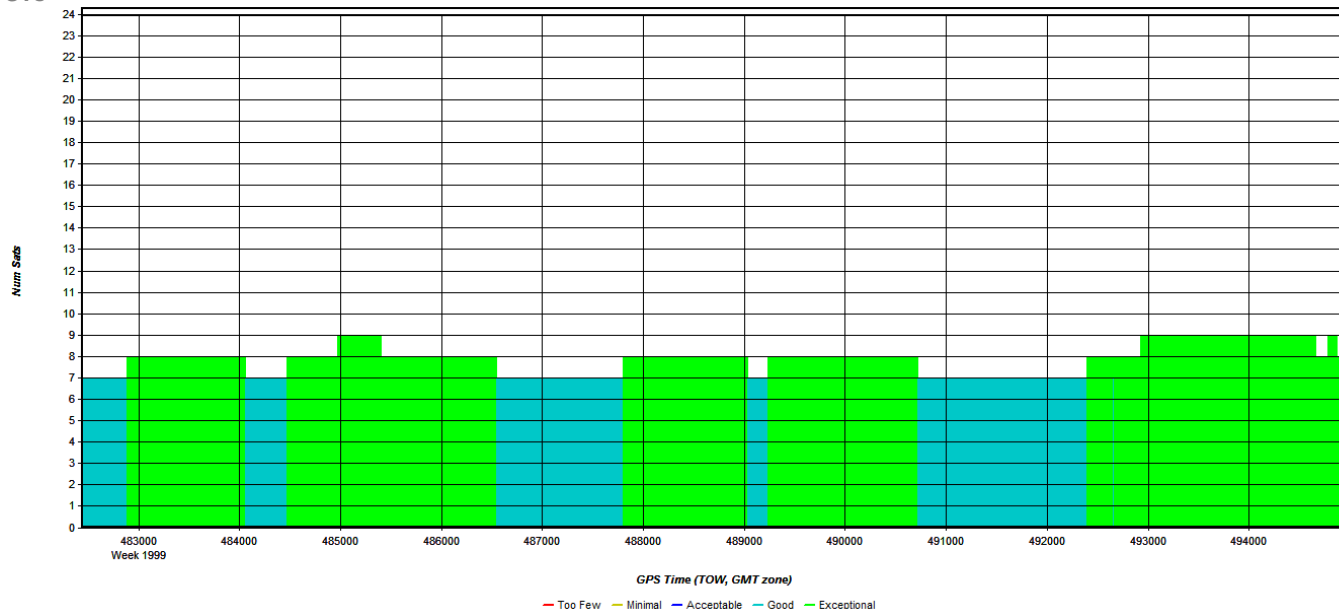


Distance from Base





SVs



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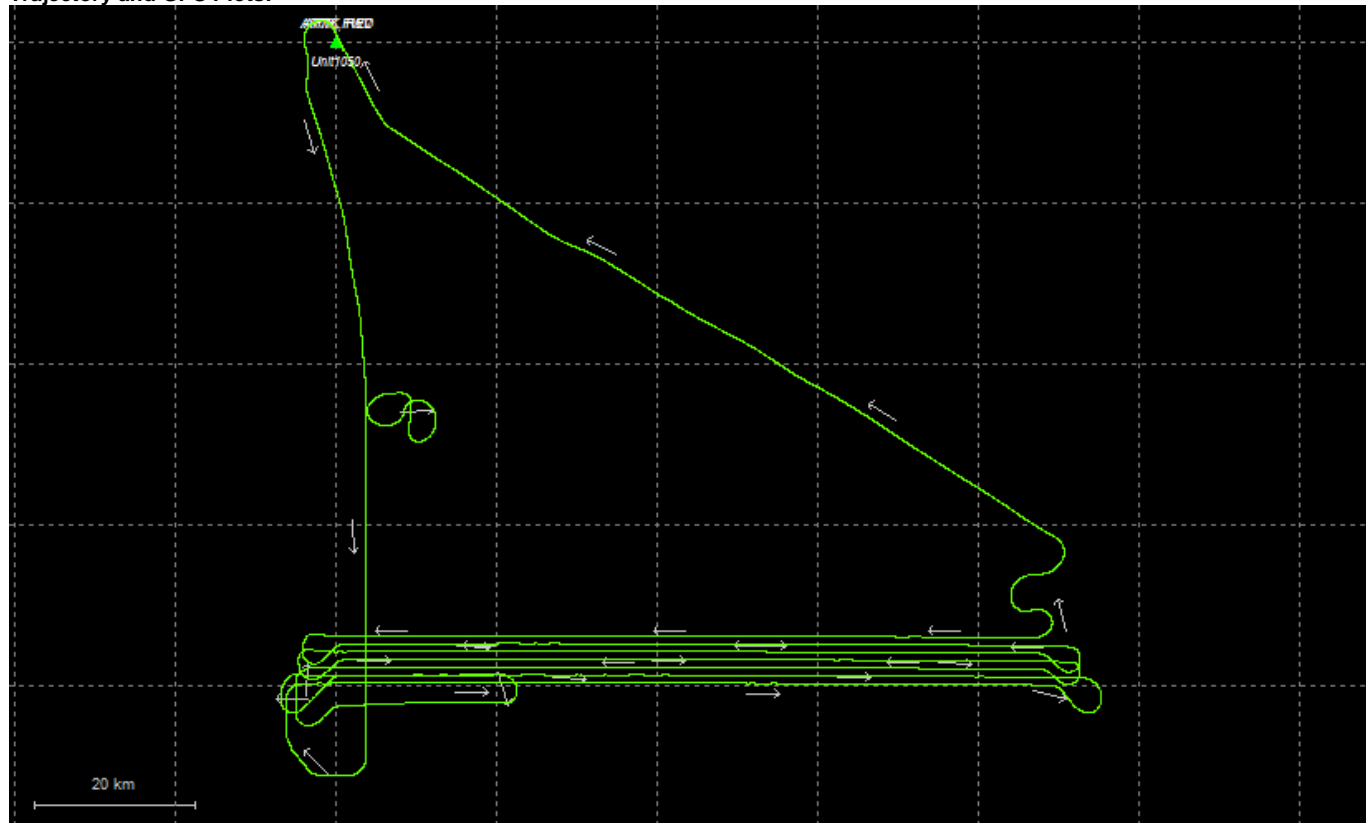


Acquisition and Processing details ----- (May 5, 2018)

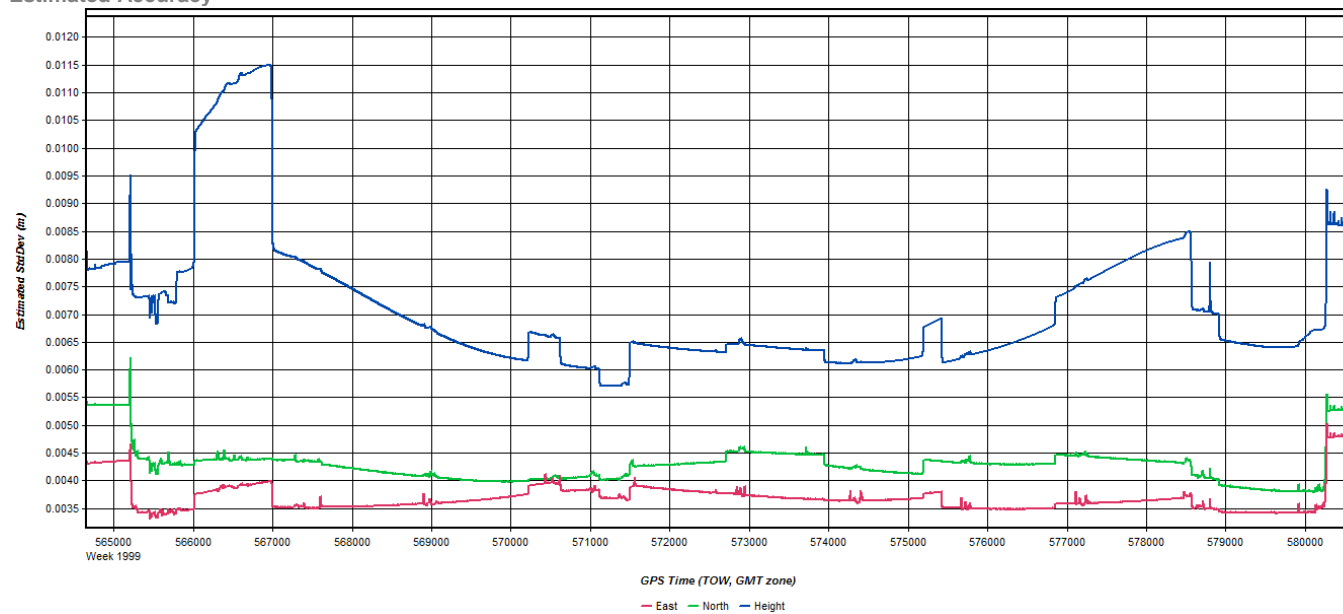
Log: 180505_118_33780055_02

FUGRO		Fugro USA Land, Inc.										ALS					
Flight Log		AC80-44-00-02															
18.012		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity						
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs							
1		KRAP	12:46	1056.6	KRAP	17:22	1061.2	4:35	4.50	4.6	0900-Production						
2																	
3																	
FGI Job #	Project Name				System	Unit	IMU	PIA	SW1	SW2-Gain	AutoScan	Ground Temp °C	Min Range Gate	Data Logger Drive			
04.33780055	USGS FY18				ALS80	118	uRS	5			Yes	10.0 25.0	8020	MM70-05			
Flight Date	GPS Day	Lift				Sun°	Solar Times (UTC)	Laser Power	Pattern	Flying Temp °C	Max Range Gate	Download Drive					
5-May-18	18-125	2				NA	NA	100%	Triangle	-6.0 -6.0	9147	MM70-05					
Mission ID (yymmdd_Sen_Job_Lift)		Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	kmWPT	AltM Setting	Shipping Track				
180505_118_33780055_02		N62912	KRAP	CCNS 8		8,700	150	55.0	5,342	27	1,595	30.11 30.11					
Pilot #1		Pilot #2		Operator #1			Operator #2										
Fred Davis		Bass		Adam Mueller													
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator		Data				
FGI 081	KRAP		GR3	U1	1.8	05-May-18 12:00		05-May-18 17:35		Unit10505m	Adam Mueller		FTP				
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions			SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate					
							12:53:22	12:58:22					5 min grd stc			18	1.2
							13:17:53	13:20:29					S-turn			20	1.2
ALS13X	7		22	1	33.5	0	13:25:02	13:33:42	S	11591	143	55.0	crossing line			19	1.2
ALS13D	28		1	53	0	82.9	13:41:31	14:00:33	E	11568	144	55.0				18	1.3
	27		53	1	82.9	0	14:06:04	14:26:17	W	11568	133	55.0				19	1.2
	27		1	10	0	15	14:31:58	14:35:48	E	11568	138	55.0	Calibration line			19	1.4
	26		1	53	0	82.9	14:47:10	15:06:40	E	11554	136	55.0				17	1.2
	25		53	1	82.9	0	15:10:16	15:30:26	W	11548	130	55.0				20	1.1
	24		1	53	0	82.9	15:34:39	15:53:48	E	11531	141	55.0				19	1.1
	23		53	1	82.9	0	15:57:38	16:17:46	W	11518	135	55.0	altitude km 74			20	1.1
	22		1	53	0	82.9	16:21:42	16:40:38	E	11509	140	55.0				20	1.2
							16:40:51	16:43:54					S Turn			19	1.2
							17:10:57	17:15:57					Ground Static			18	1.2

Trajectory and GPS Plots:

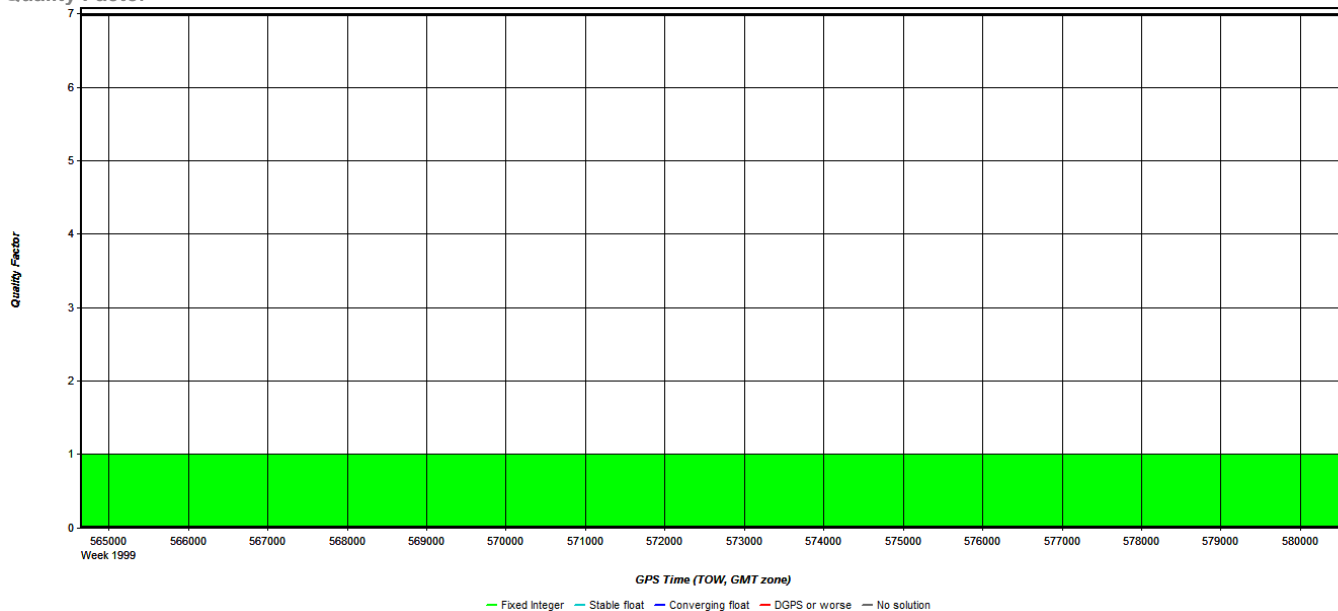


Estimated Accuracy

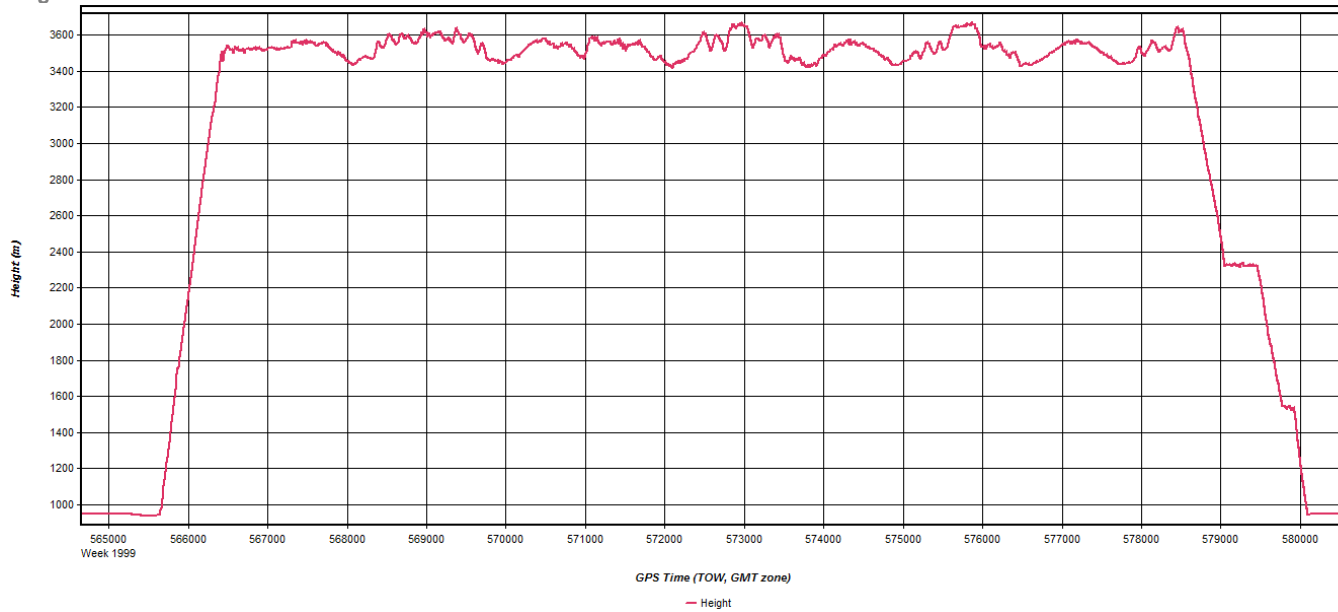




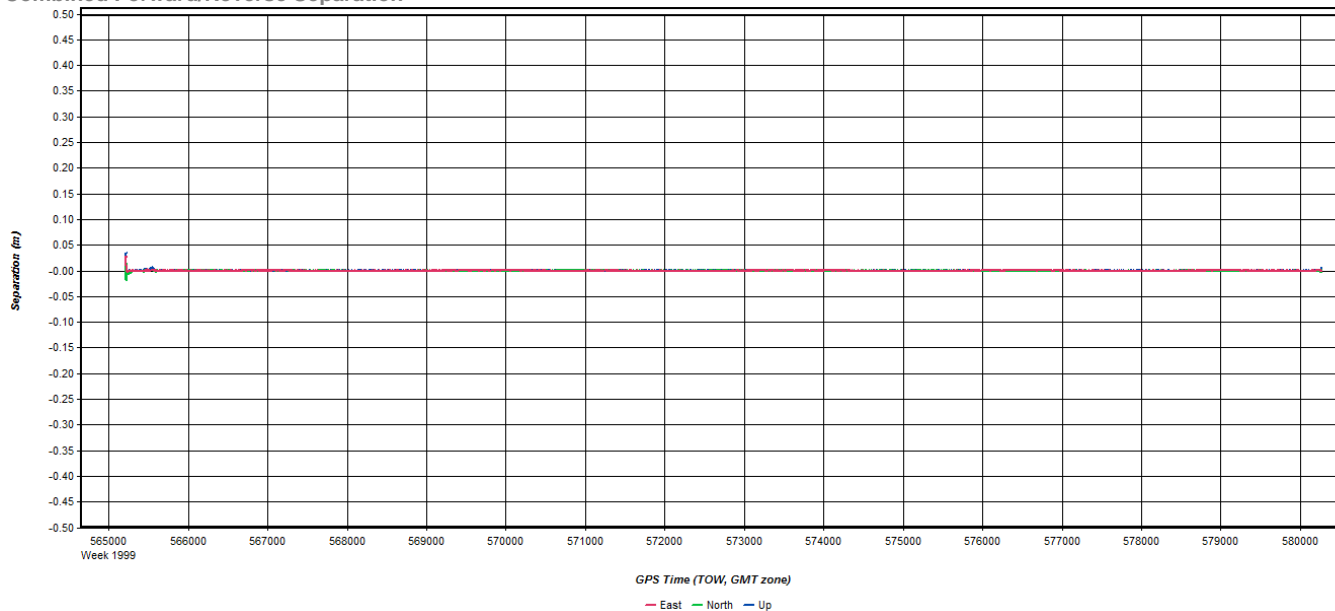
Quality Factor



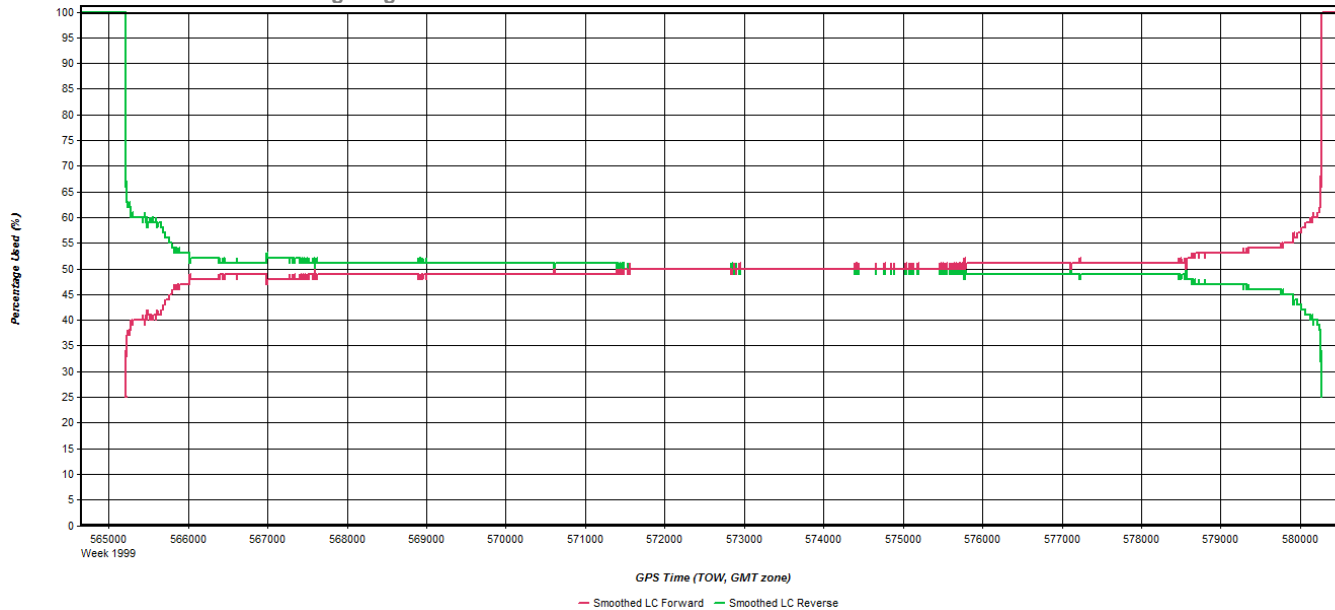
Height



Combined Forward/Reverse Separation

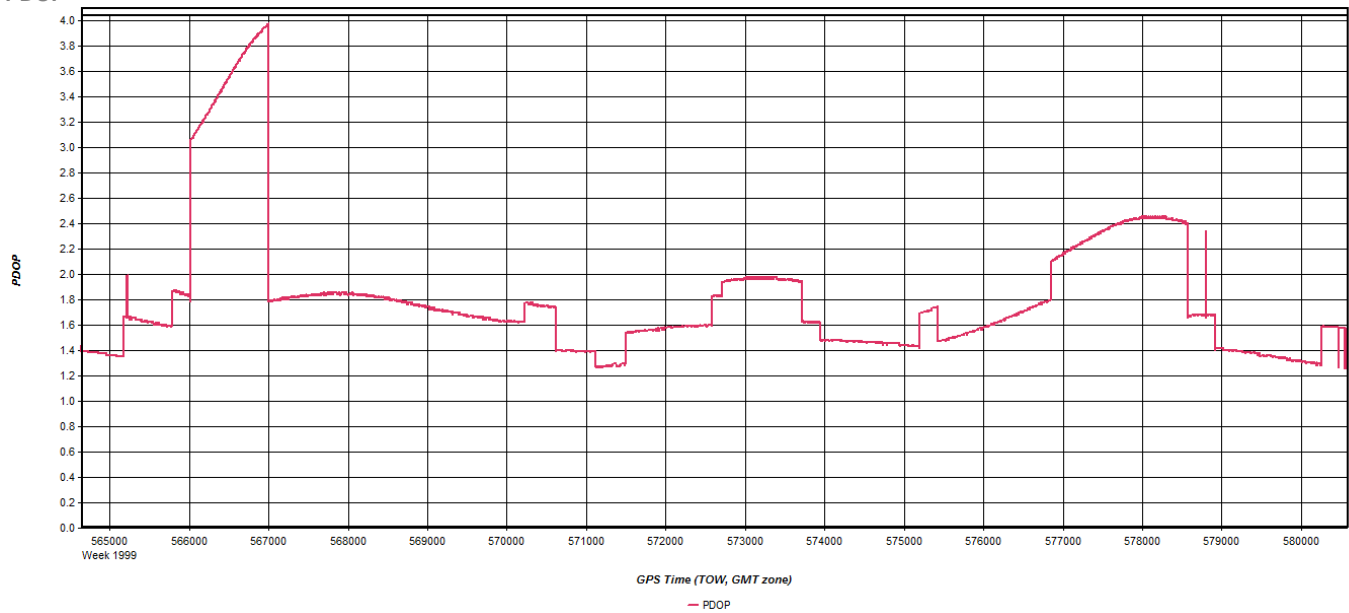


Combined Forward/Reverse Weighting

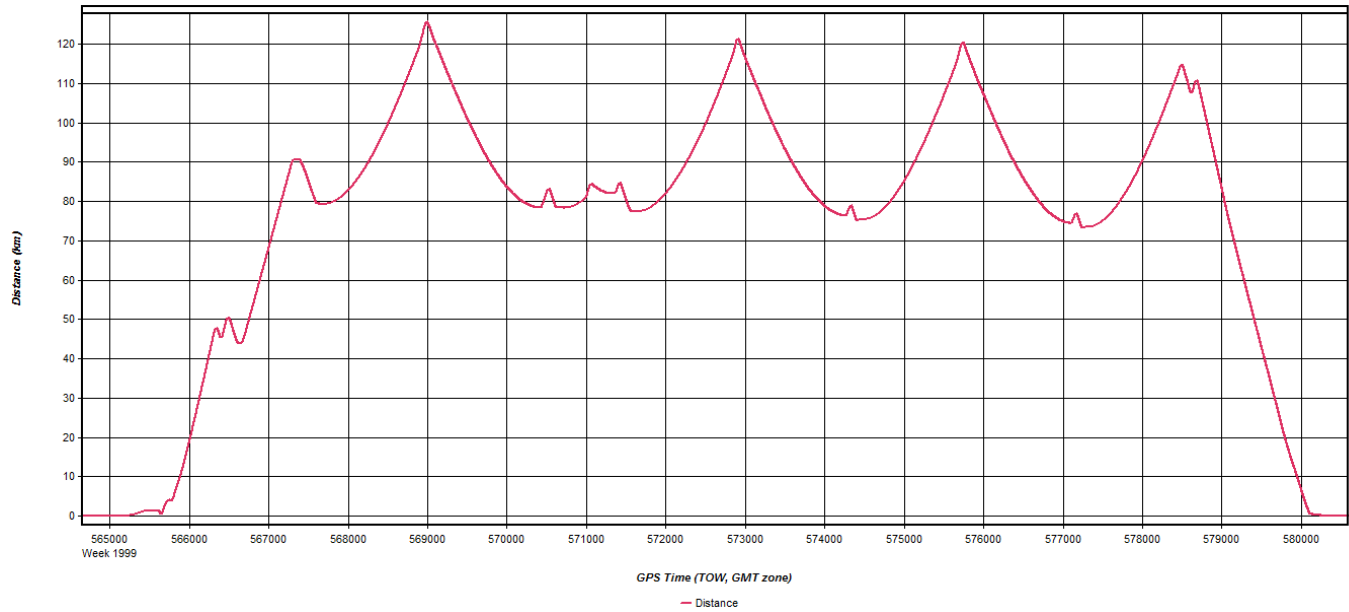


USGS COLLECTION REPORT

PDOP

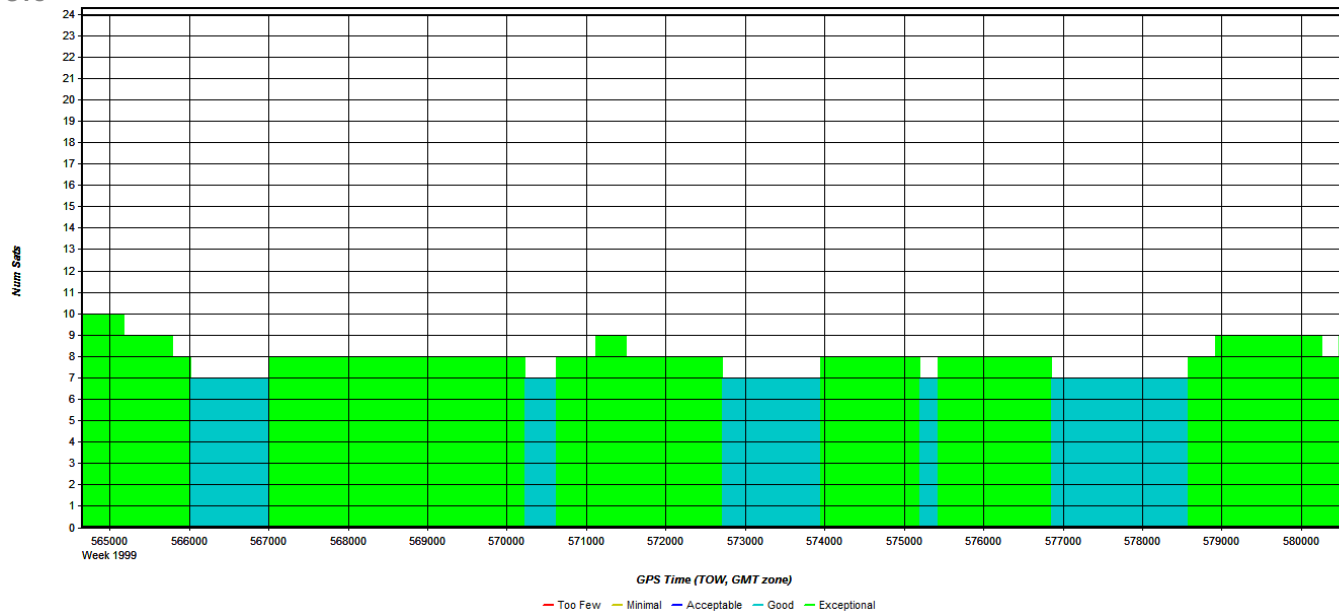


Distance from Base





SVs



**USGS
COLLECTION REPORT**



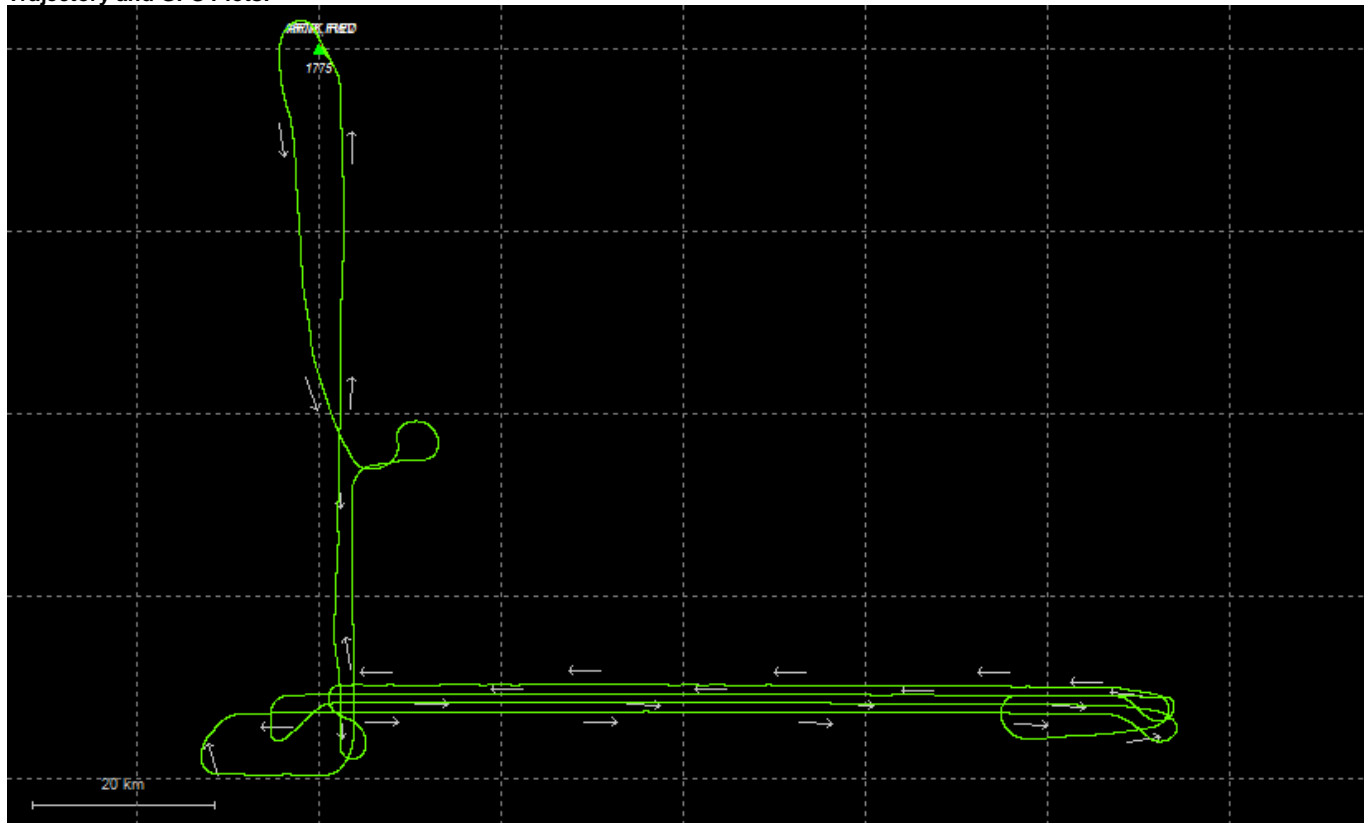
Acquisition and Processing details ----- (May 8, 2018)

Log: 180508_118_33780055_03

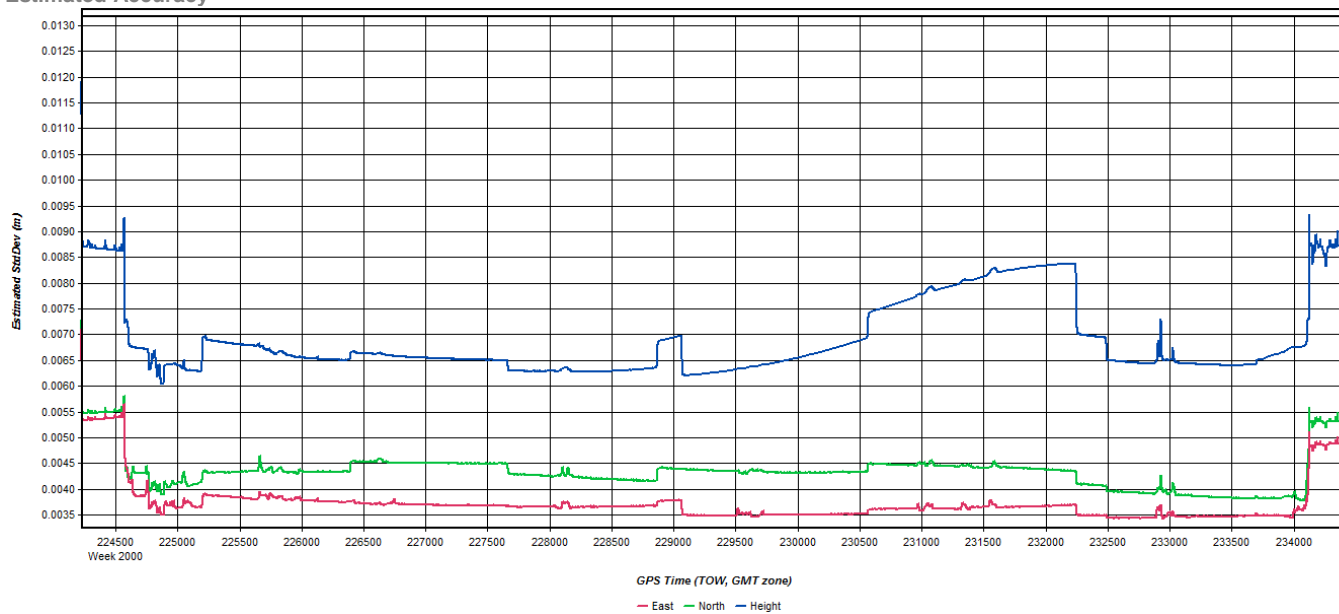
FUGRO		Fugro USA Land, Inc.										ALS				
Flight Log		AC80-44-00-02														
18.012		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity					
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs						
1		KRAP	14:09	1062.1	KRAP	17:10	1065.2	3:01	3.00	3.1	0900-Production					
2																
3																
FGI Job #	Project Name			System	Unit	IMU	PIA	SW1	SW2-Gain	AutoScan	Ground Temp °C	Min Range Gate	Data Logger Drive			
04.33780055	USGS FY18			ALS80	118	uRS	5			Yes	17.0 19.0	8020	MM70-07			
Flight Date	GPS Day	Lift	Sun°			Solar Times (UTC)		Laser Power	Pattern	Flying Temp °C	Max Range Gate	Download Drive				
8-May-18	18-128	3	NA			NA		100%	Triangle	-4.0 -2.0	9147	MM70-07				
Mission ID (yymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	kmWPT	Altm Setting	Shipping Track				
180508_118_33780055_03	N62912	KRAP	CCNS 8		8,700	150	55.0	5,342	27	1,595	30.01 30.01					
Pilot #1	Pilot #2	Operator #1		Operator #2		/Flight-JOBS/33780055_USGS SD FY18_NRCS-USGS/Data										
George Jordan		Chris Fought														
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator	Data				
FGI 081	KRAP		R7-14	R7-14	1.8	5/8/18 1403		5/8/18 1715		17751280.T02	Chris Fought	FTP				
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOF
	FGI	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate				
							14:17:00	14:22:00					5 min grd stc		19	1.2
							14:41:00	14:44:00					acquisition turns		17	1.2
ALS13X	7		22	8	33.5	11.2	14:46:55	14:52:05	180	11591	145	55.0	Xline		17	1.2
ALS13D	21		1	53	0	82.9	15:01:30	15:20:05	90	11482	145	55.0			18	1.2
	20		53	1	82.9	0	15:24:24	15:44:30	270	11479	145	55.0			19	1.2
	19		1	53	0	82.9	15:49:50	16:09:00	90	11482	145	55.0			20	1.1
	19		53	49	82.9	76.6	16:12:55	16:14:55	270	11482	145	55.0	calibration line		21	1.2
	18		53	1	82.9	0	16:21:18	16:41:07	90	11472	135	55.0	cld around km46,34,12,2		20	1.2
							16:41:10	16:44:00					acquisition turns		19	1.2
							17:02:00	17:07:00					ground static		19	1.3

11 th

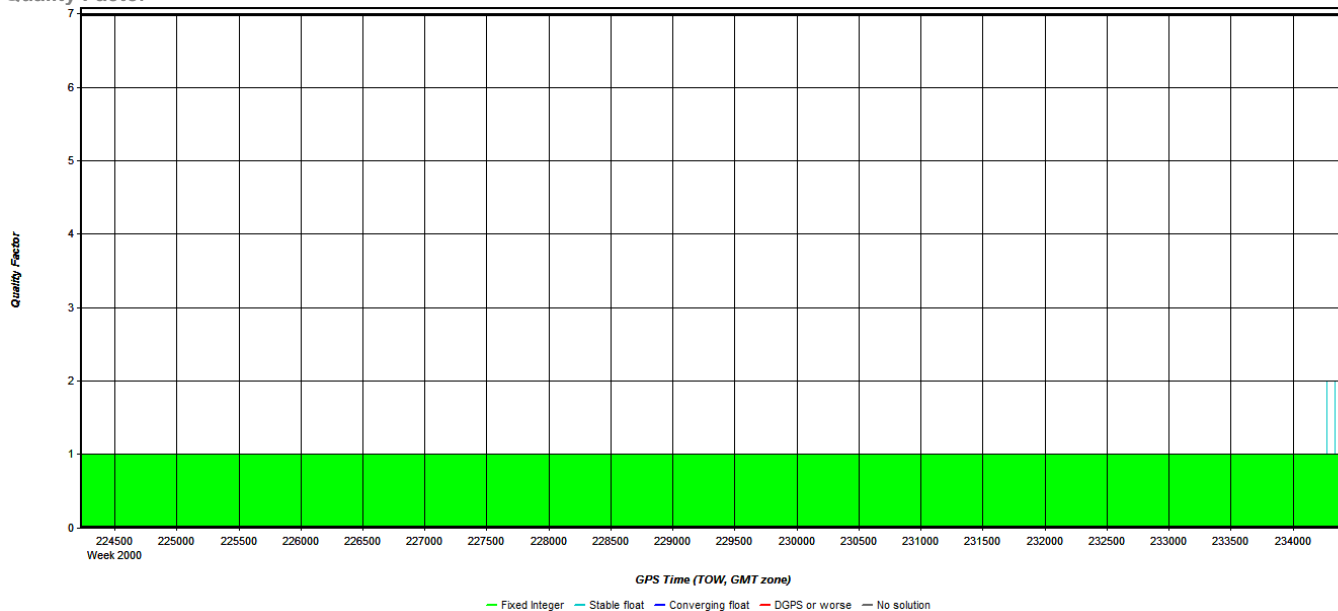
Trajectory and GPS Plots:



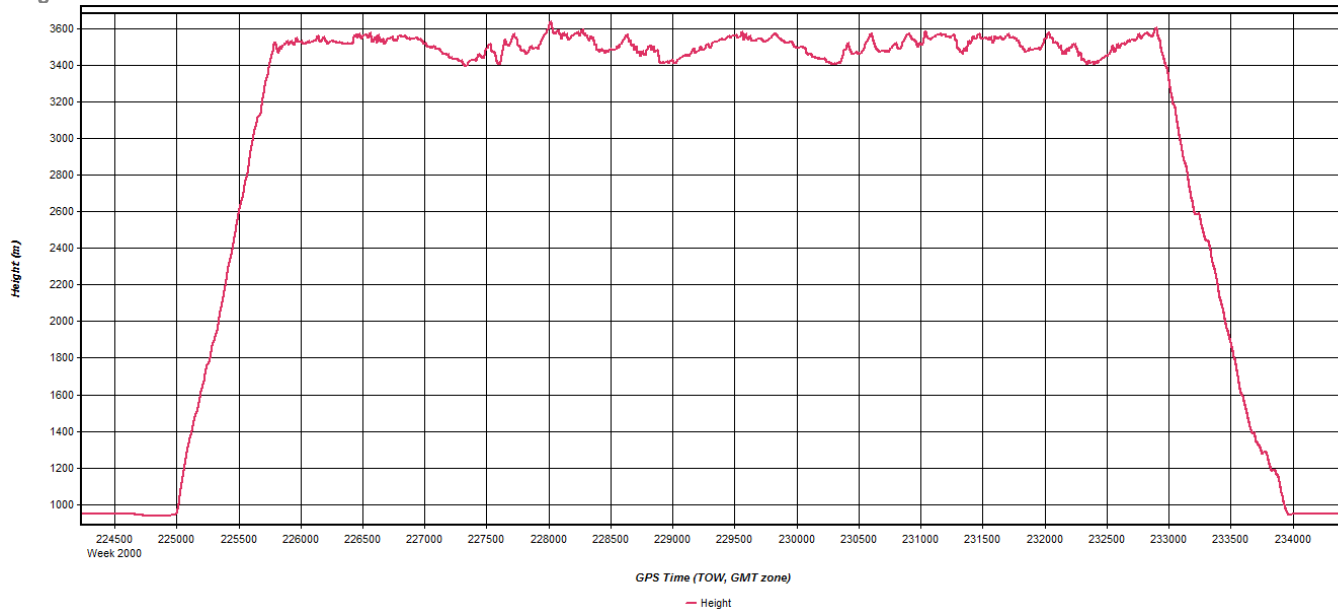
Estimated Accuracy



Quality Factor

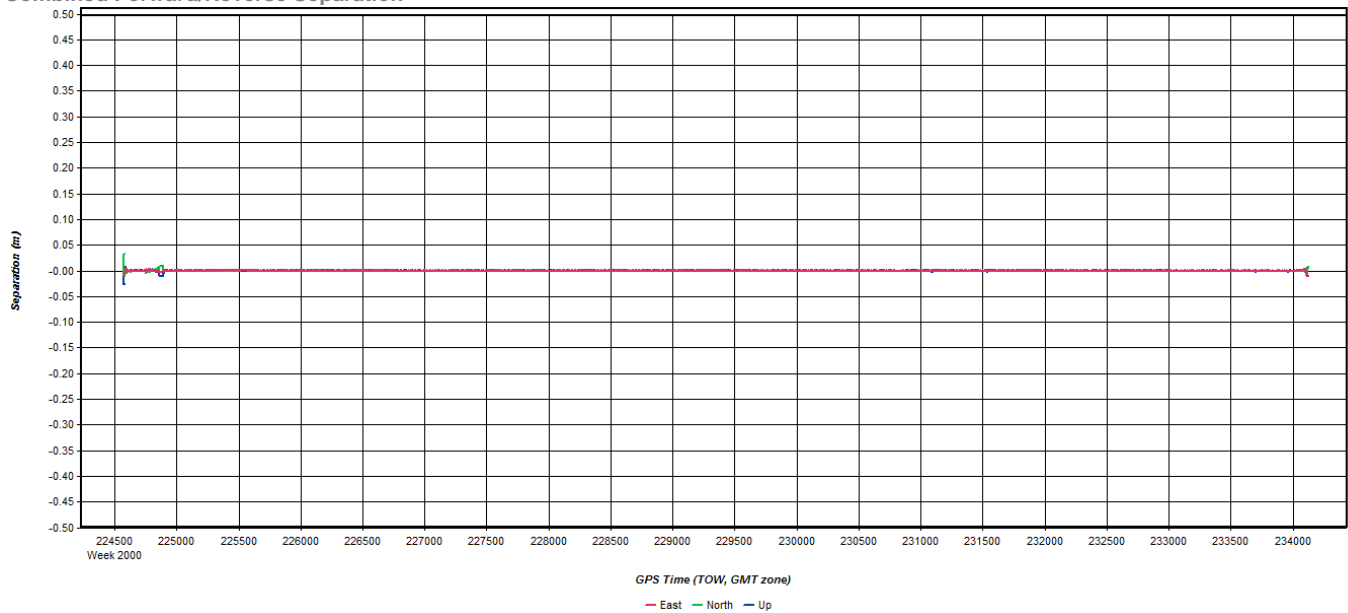


Height

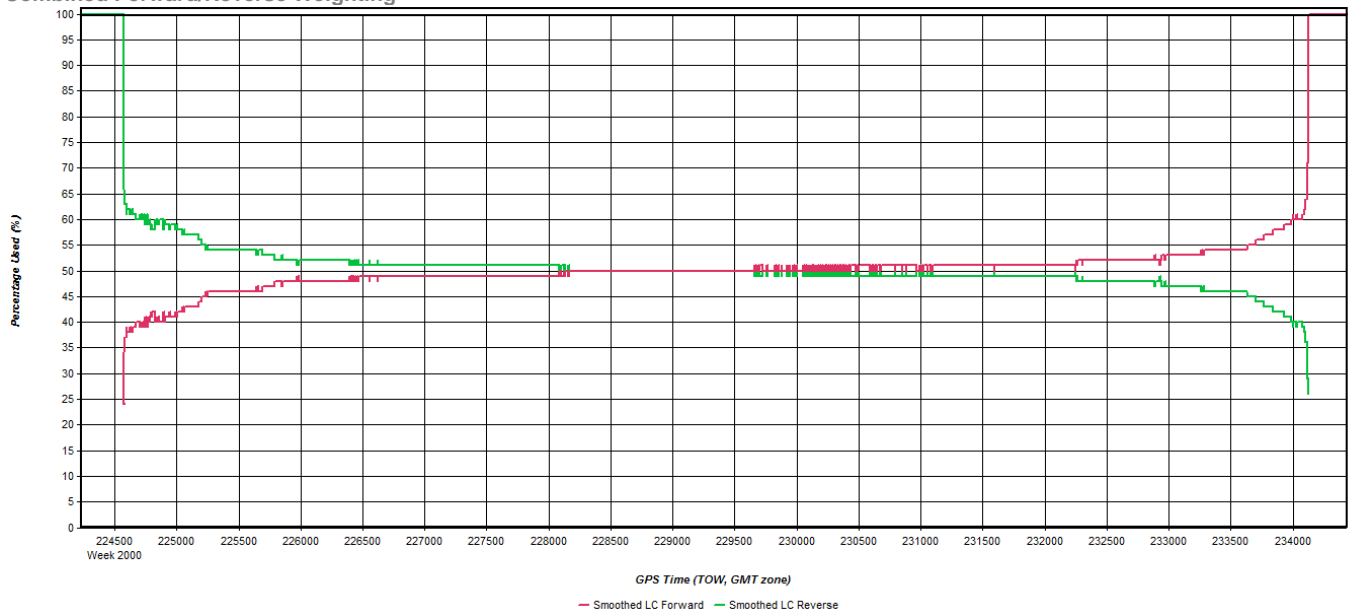


USGS COLLECTION REPORT

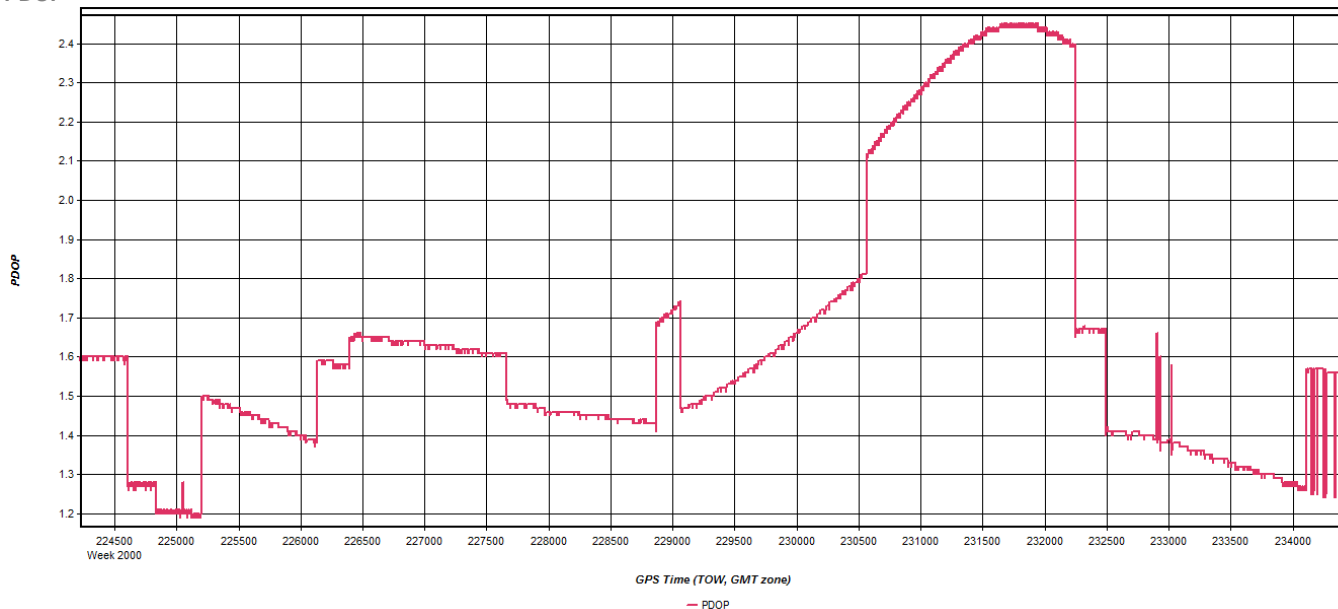
Combined Forward/Reverse Separation



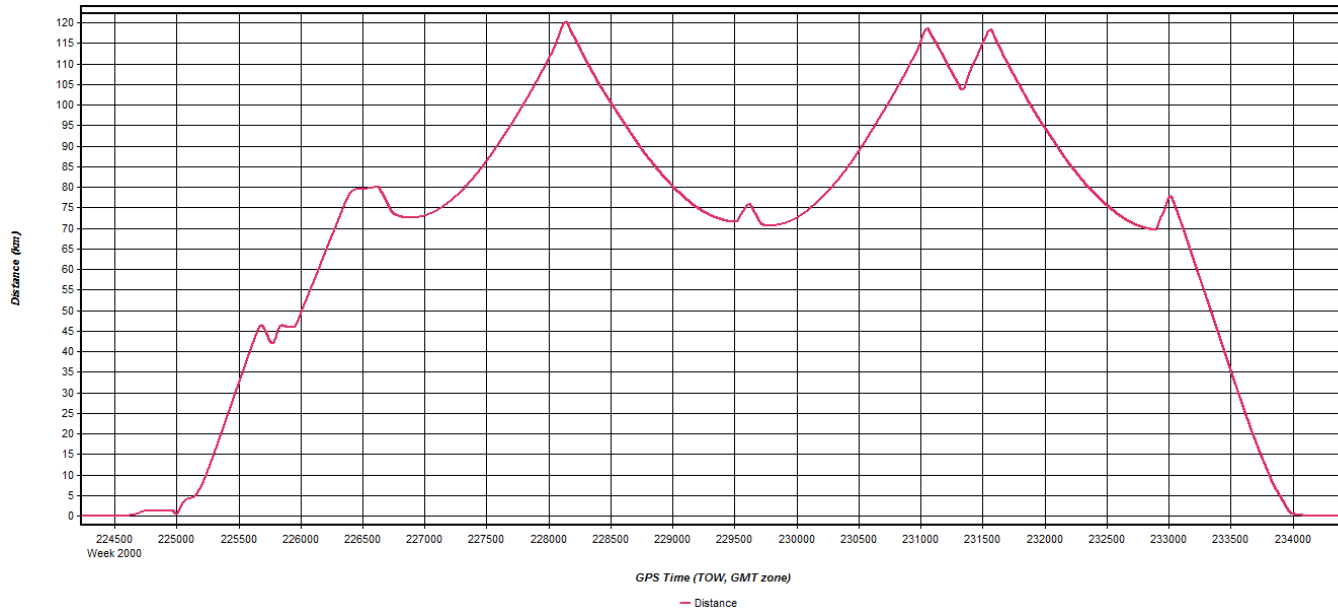
Combined Forward/Reverse Weighting



PDOP

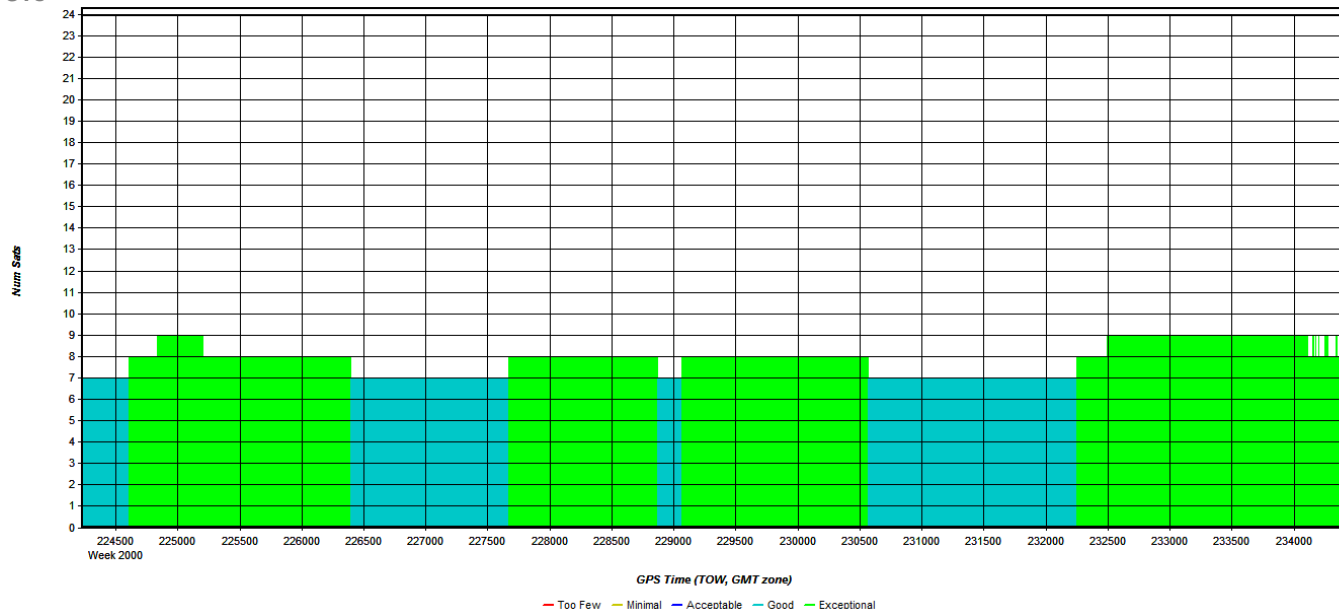


Distance from Base





SVs



**USGS
COLLECTION REPORT**



Acquisition and Processing details ----- (May 8, 2018)

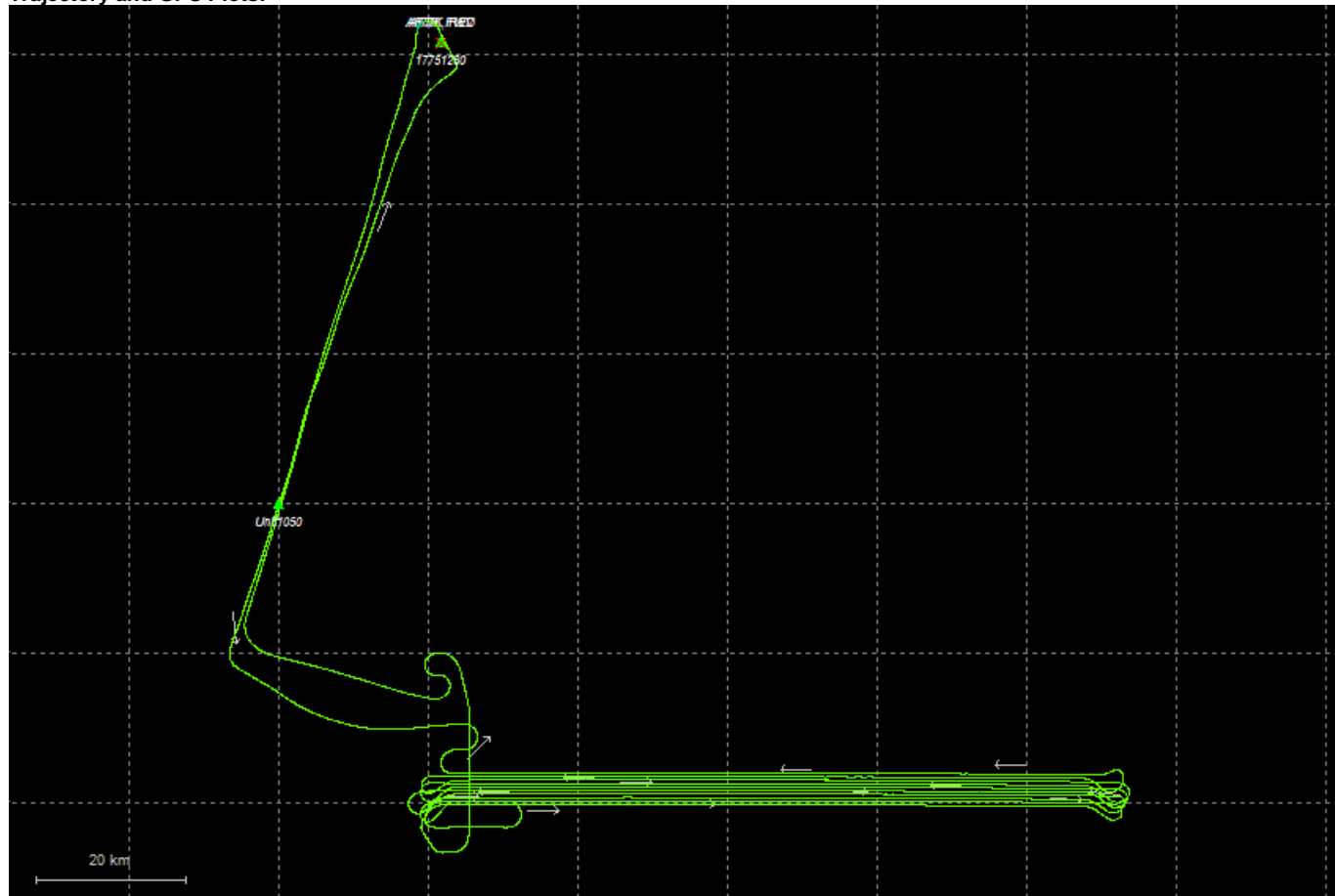
Log: 180508_165_33780055_12

18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	13:01	1059.1	KRAP	18:51	1064.5	5:50	5:75	5:4	0900-Production
2										
3										

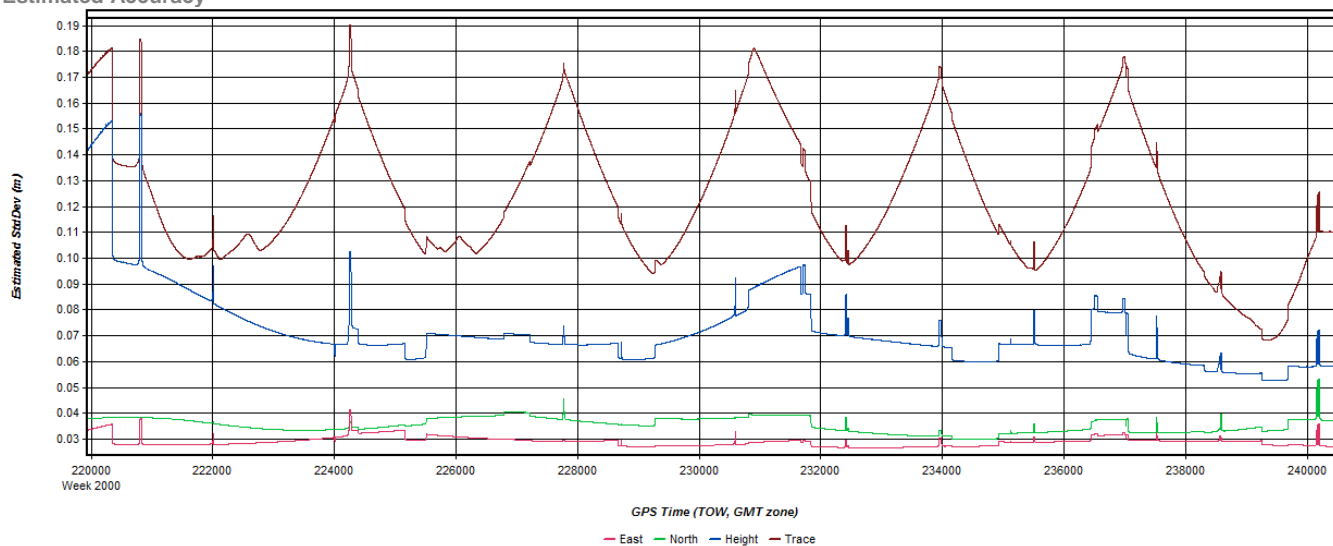
Fugro USA Land, Inc.		Riegl Flight Log	
		AC80-50-00-02	

FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU FMU-300	Ground Temp °C 14.0 19.0		Min Range' 1542	Data Logger Drives DR680-15						
Flight Date 8-May-18	GPS Day 18-128	Lift 12	Sun° N/A	Solar Times (UTC) N/A	Pulse Rate 330	Flying Temp °C 12.0 12.0		Max Range' 2933	Download Drive NS1TB#12						
Mission ID (yyymmdd_Sen_Job_Lift) 180508_165_33780055_12	Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV 130	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 30.01 30.00	Humidity @ Alt 83%	Shipping Track		
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Eric Mueller		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3-5	Ant ID GR3-5	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator Riley Forsyth		Data		
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							13:07:13	13:10:13					GROUND-STATIC @ KRAP	14	1.6
							13:29:34	13:34:34		6,168	184		OVERFLY 7002(REMOTE BASE)	16	1.2
							13:39:00	13:42:00		5,490	155		PRE ACQUISITION CALIBRATION	16	1.2
RGL_13EX	2		55	30	23.8	12.8	13:45:00	13:48:00	180	5,340	123		CROSS LINE	16	1.2
RGL_13E	35		1	189	0	82.7	13:53:00	14:15:00	090	5,440	124			17	1.1
	34		189	1	82.7	0	14:18:00	14:40:00	270	5,440	124			18	1.0
	34		1	10	0	4	14:44:00	14:45:00	090	5,440	122		CALIBRATION LINE	16	1.2
	33		1	189	0	82.7	14:52:00	15:14:00	090	5,390	124			15	1.2
	32		189	1	82.7	0	15:18:00	15:39:00	270	5,390	124			16	1.2
	31		1	189	0	82.7	15:44:00	16:06:00	090	5,340	121			17	1.1
	30		189	1	82.7	0	16:09:00	16:31:00	270	5,340	123			18	1.2
	29		1	189	0	82.7	16:35:00	16:57:00	090	5,340	120			16	1.3
	28		189	1	82.7	0	17:00:00	17:22:00	270	5,340	125			19	1.1
	27		1	189	0	82.7	17:26:00	17:48:00	090	5,340	128			17	1.2
	26		189	1	82.7	0	17:51:00	18:13:00	270	5,340	124			18	1.0
							18:13:45	18:16:30		5,570	120		POST ACQUISITION CALIBRATION	17	125.0
							18:26:19	18:31:19		5,972	156		OVERFLY 7002(REMOTE BASE)	19	1.0
							18:47:23	18:48:23					GROUND-STATIC @ KRAP	10	1.4

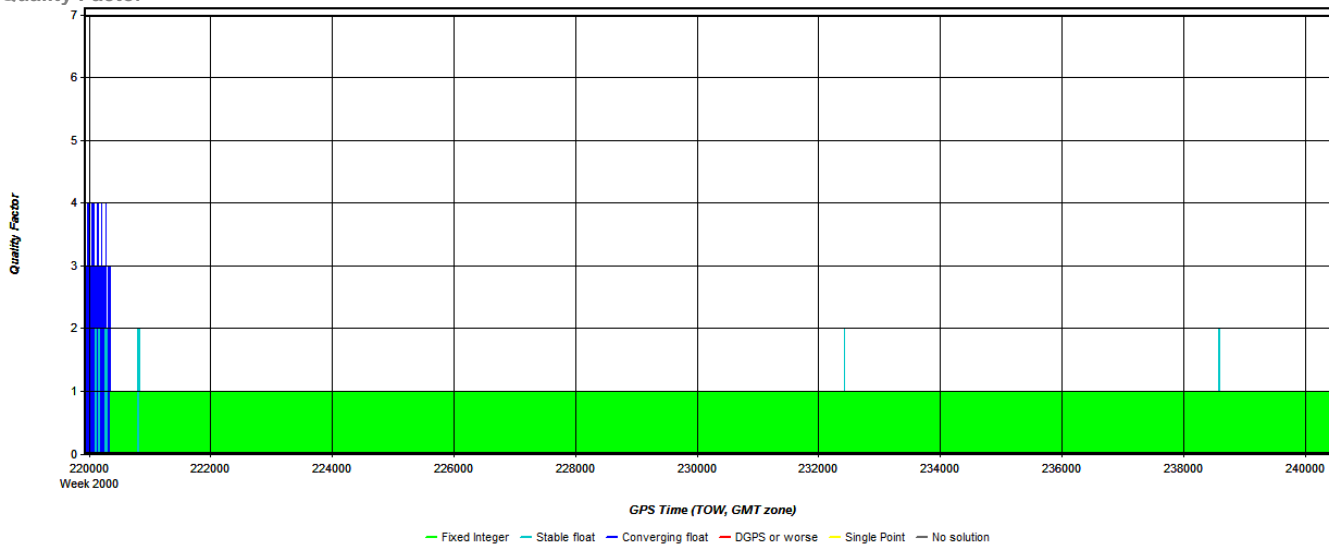
Trajectory and GPS Plots:



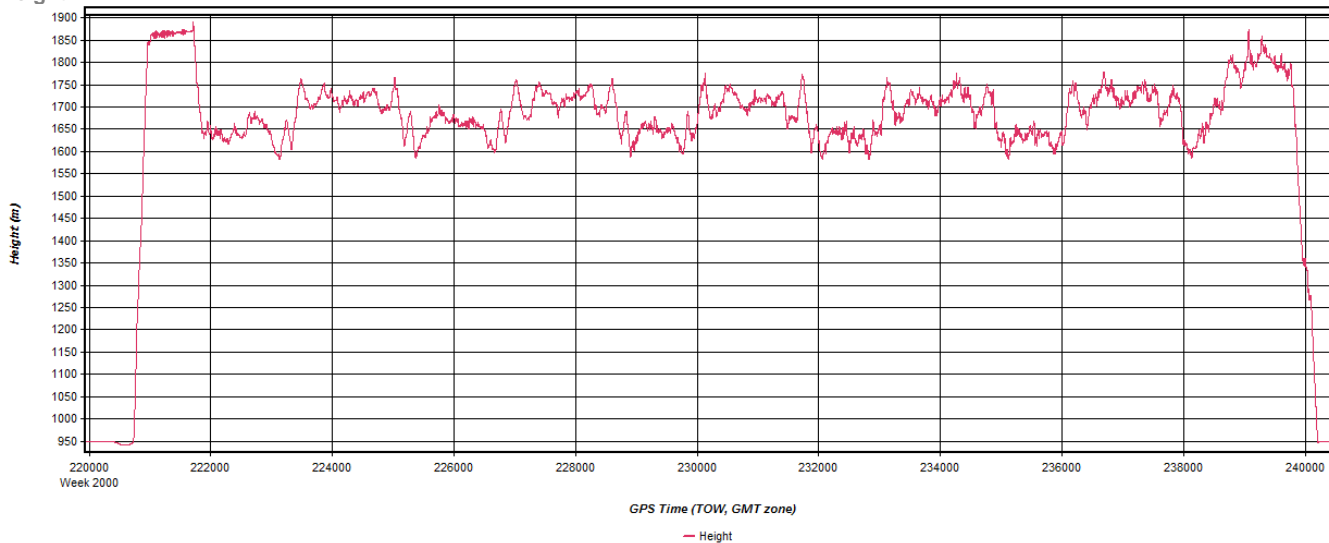
Estimated Accuracy



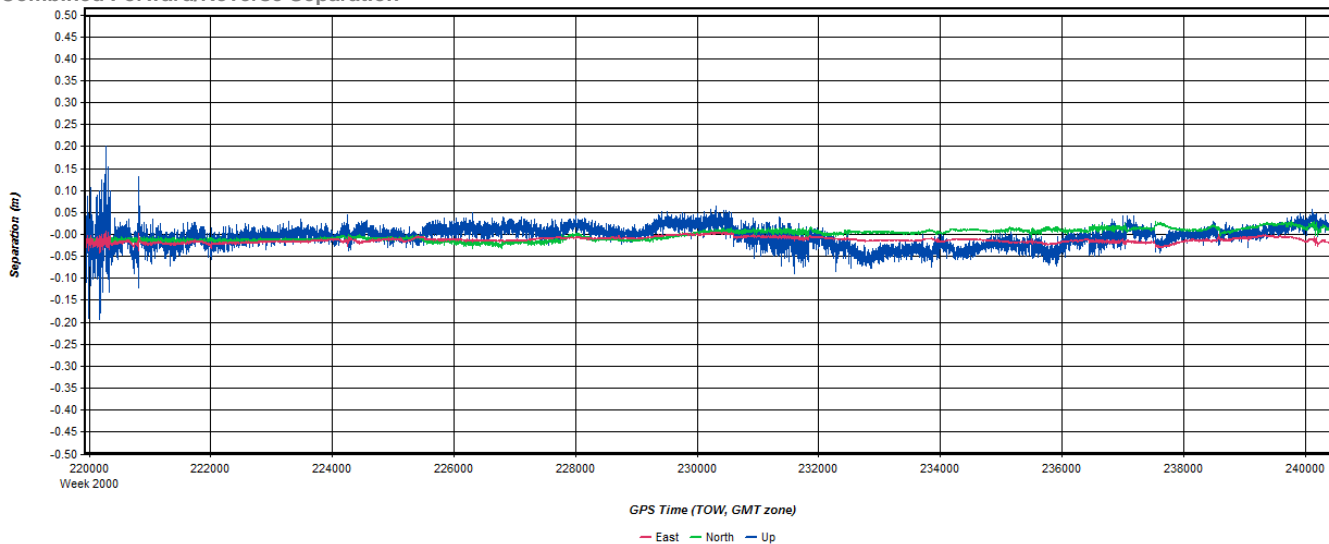
Quality Factor



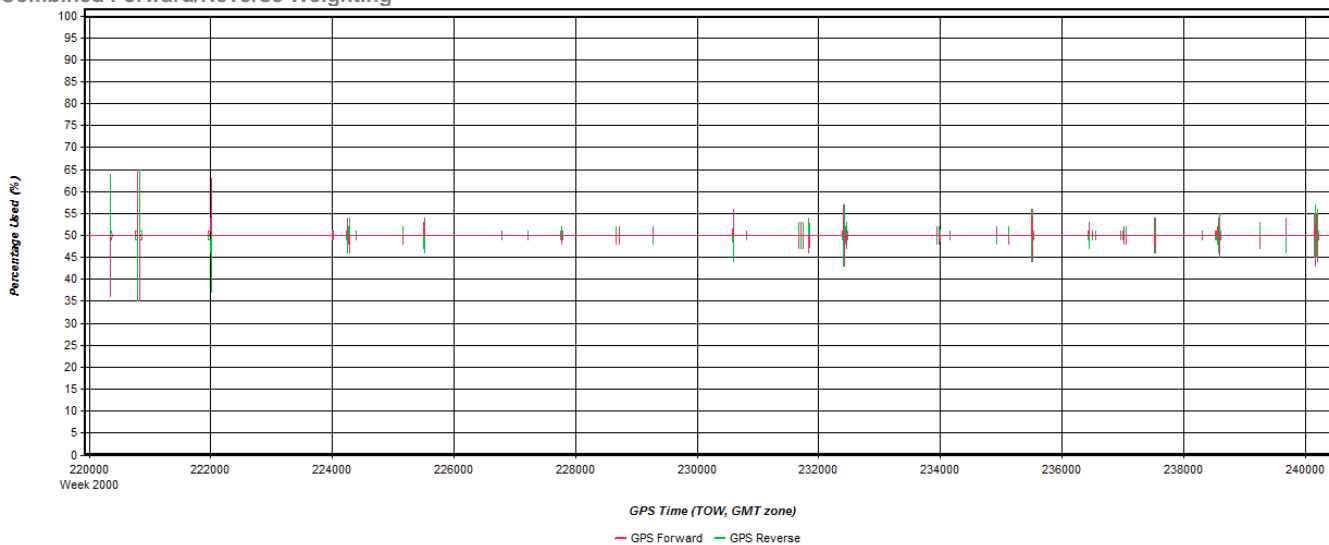
Height



Combined Forward/Reverse Separation

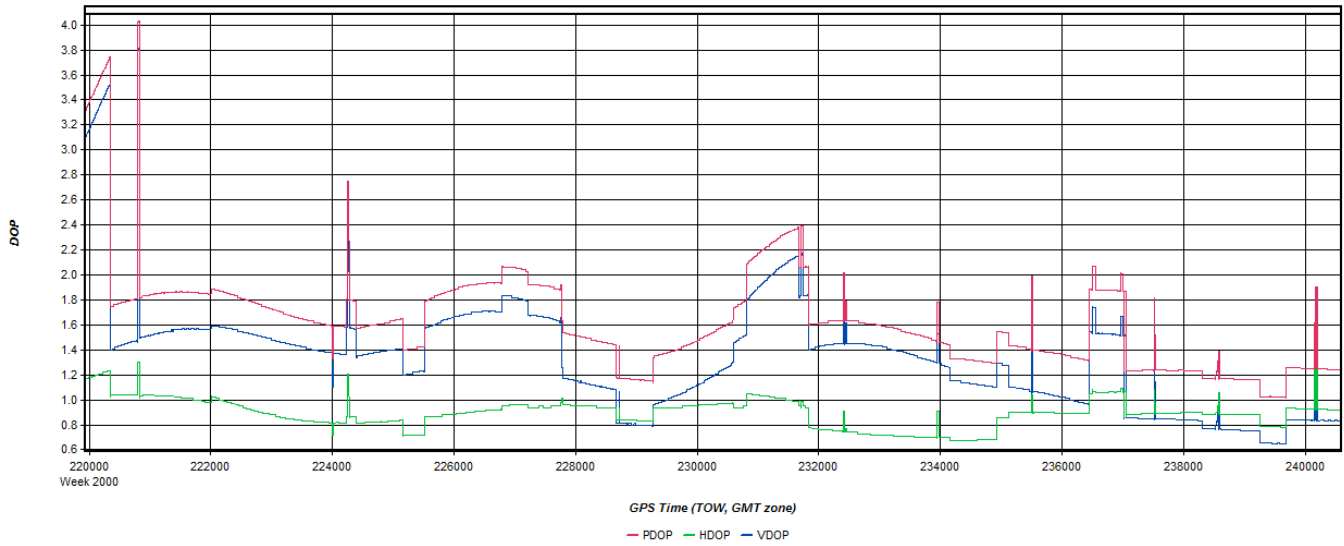


Combined Forward/Reverse Weighting

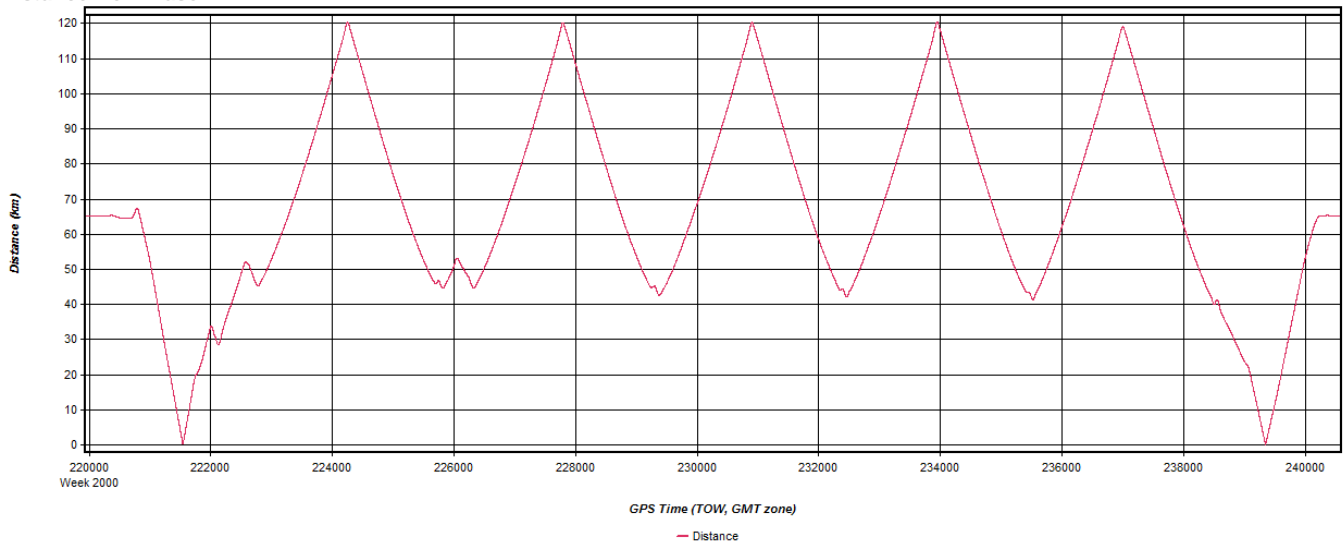


USGS COLLECTION REPORT

PDOP



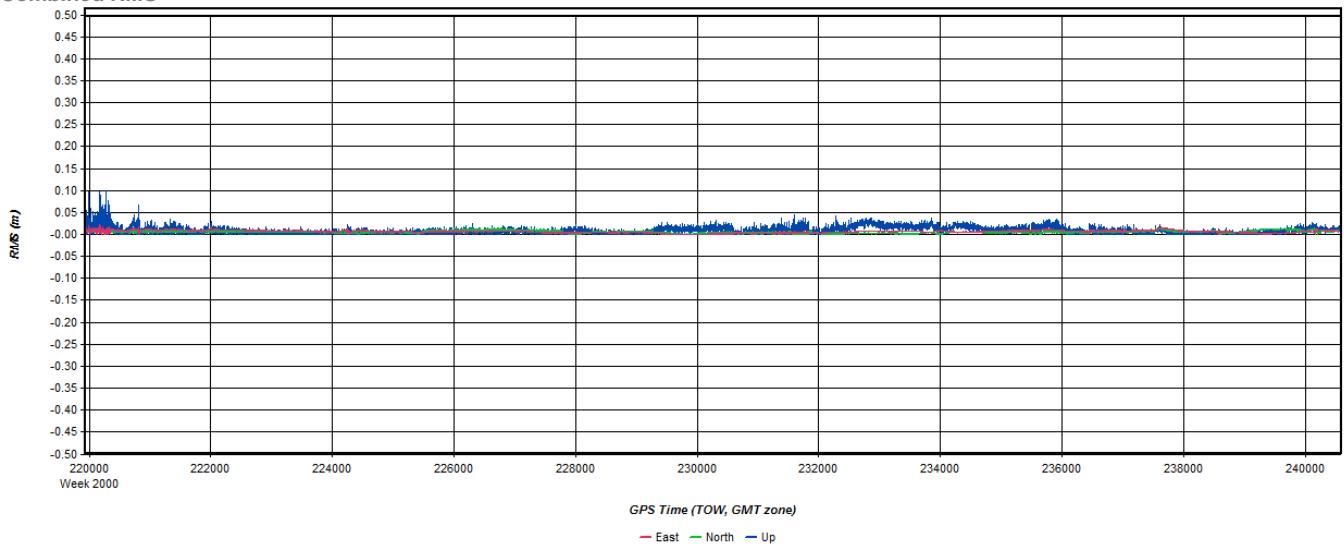
Distance from Base



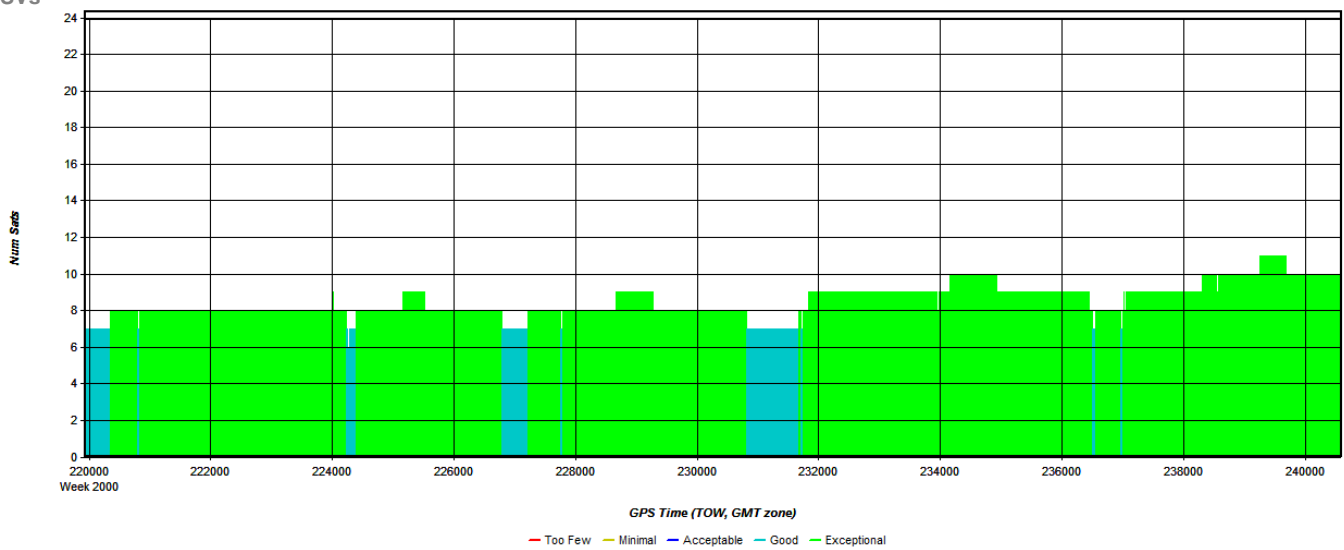


USGS COLLECTION REPORT

Combined RMS



SVs



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COLLECTION REPORT**



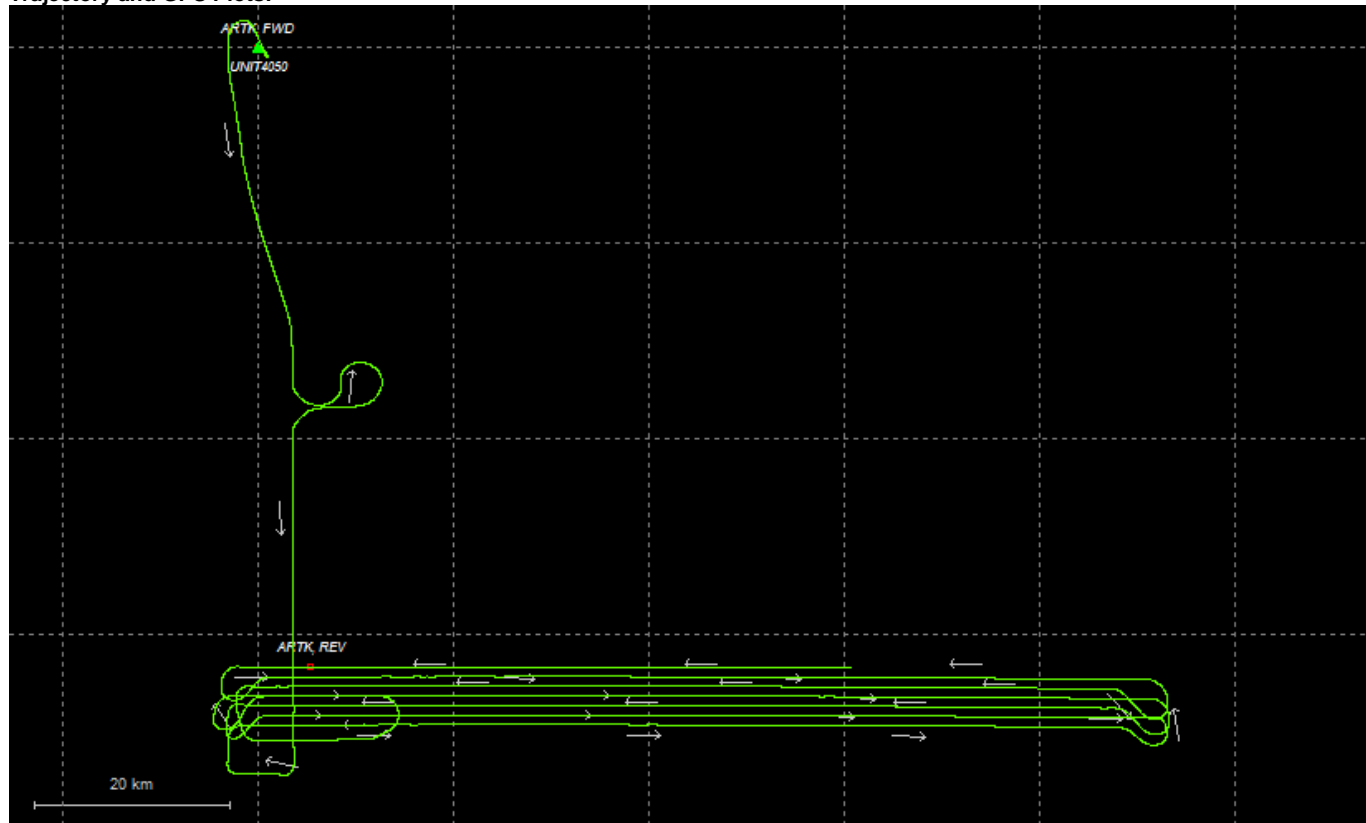
Acquisition and Processing details ----- (May 9, 2018)

Log: 180509_118_33780055_04

FUGRO		Fugro USA Land, Inc.										ALS				
		Flight Log										AC80-44-00-02				
18.012		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity					
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs						
1		KRAP	12:52	1065.2	KRAP	16:57	1069.3	4:05	4.00	4.1	0900-Production					
2																
3																
FGI Job #	Project Name				System	Unit	IMU	PIA	SW1	SW2-Gain	AutoScan	Ground Temp °C	Min Range Gate	Data Logger Drive		
04.33780055	USGS FY18				ALS80	118	uRS	5			Yes	17.0 19.0	8020	MM70-01		
Flight Date	GPS Day	Lift				Sun°	Solar Times (UTC)	Laser Power	Pattern	Flying Temp °C	Max Range Gate	Download Drive				
9-May-18	18-129	4				NA	NA	100%	Triangle	-5.0 -3.0	9147					
Mission ID (yymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	kmWPT	Altm Setting	Shipping Track				
180509_118_33780055_04	N62912	KRAP	CCNS 8		8,700	150	55.0	5,342	27	1,595	29.96 29.92					
Pilot #1		Pilot #2		Operator #1			Operator #2									
Jeffrey Clarke				Chris Fought						/Flight-JOBS/33780055_USGS SD FY18_NRCS-USGS/Data						
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator		Data			
FGI 081	KRAP		GR3-04	GR3-04	1.8	5/9/18 1215		5/9/18 2230		Unit40509m.tps	Chris Fought		FTP			
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate				
							12:57:00	13:02:00					5 min grd stc		16	1.1
							13:17:00	13:20:00					acquisition turns		16	1.3
ALS13X	7		22	10	33.5	14.4	13:25:55	13:30:05	180	11591	147	55.0	X line		16	1.3
ALS13D	17		1	53	0	82.9	13:35:09	13:53:43	90	11482	145	55.0			16	1.3
	16		53	1	82.9	0	13:57:22	14:16:05	270	11472	141	55.0			17	1.2
	15		1	53	0	82.9	14:19:33	14:38:05	90	11449	148	55.0			18	1.0
	14		53	1	82.9	0	14:42:02	15:00:55	270	11463	147	55.0			17	1.1
	14		1	5	0	6.4	15:04:52	15:06:36	90	11463	145	55.0	calibration line		16	1.3
	13		1	53	0	82.9	15:14:00	15:32:27	90	11459	147	55.0			15	1.3
	12		53	1	82.9	0	15:36:12	15:54:54	270	11443	144	55.0			16	1.2
	11		1	53	0	82.9	15:58:21	16:17:00	90	11413	145	55.0			16	1.3
							16:17:00	16:20:00					acquisition turns		17	1.2
							16:49:00	16:54:00					ground static		18	1.3

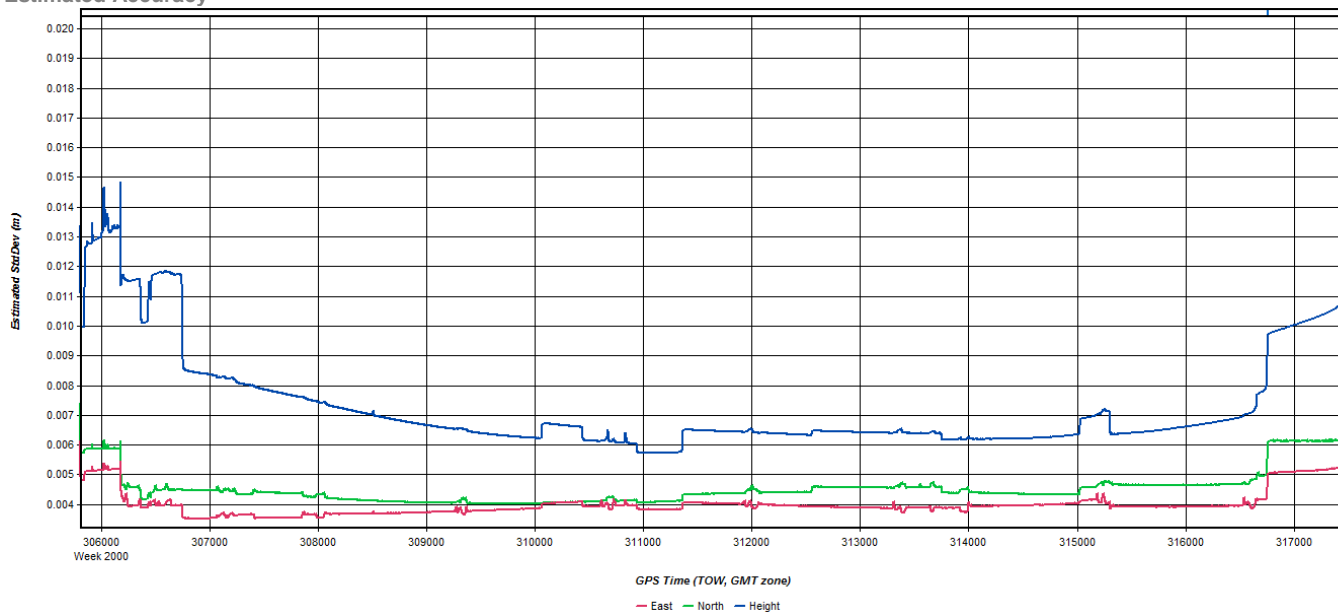
4 through

Trajectory and GPS Plots:



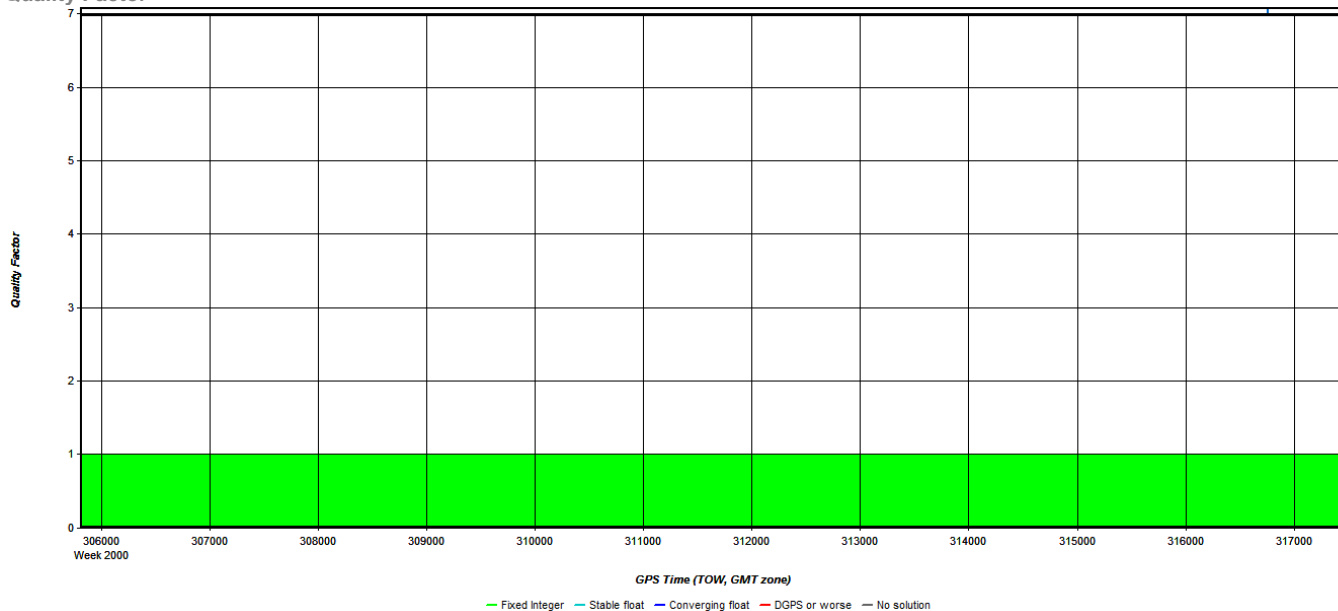
46

Estimated Accuracy

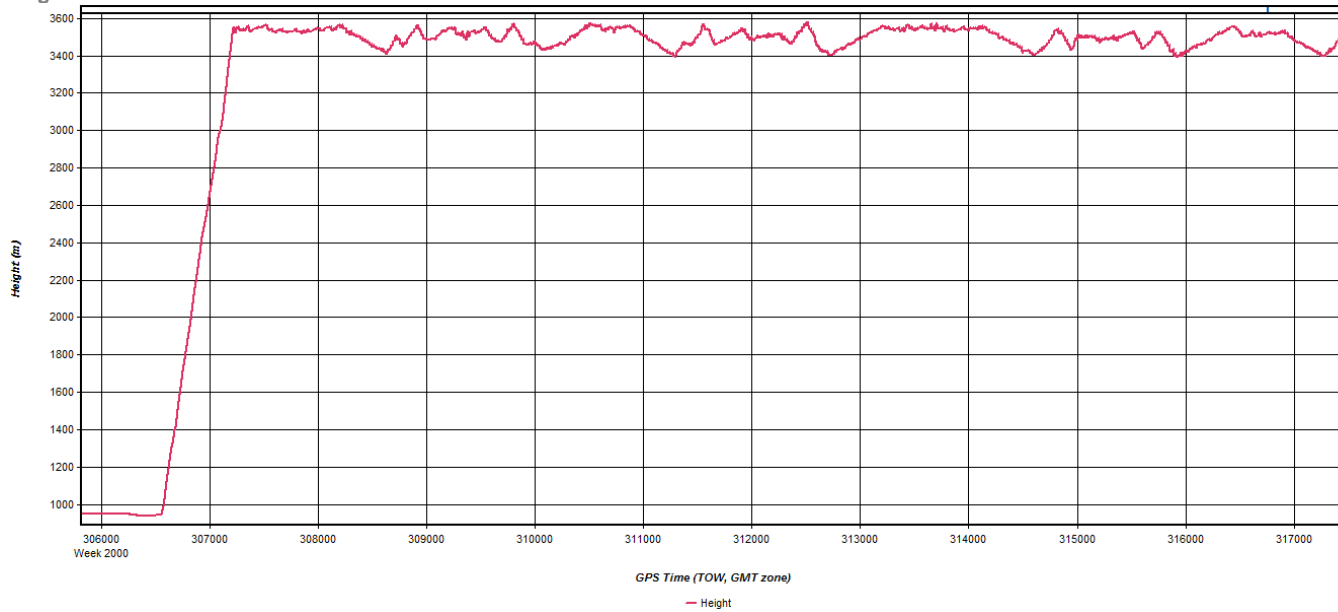




Quality Factor

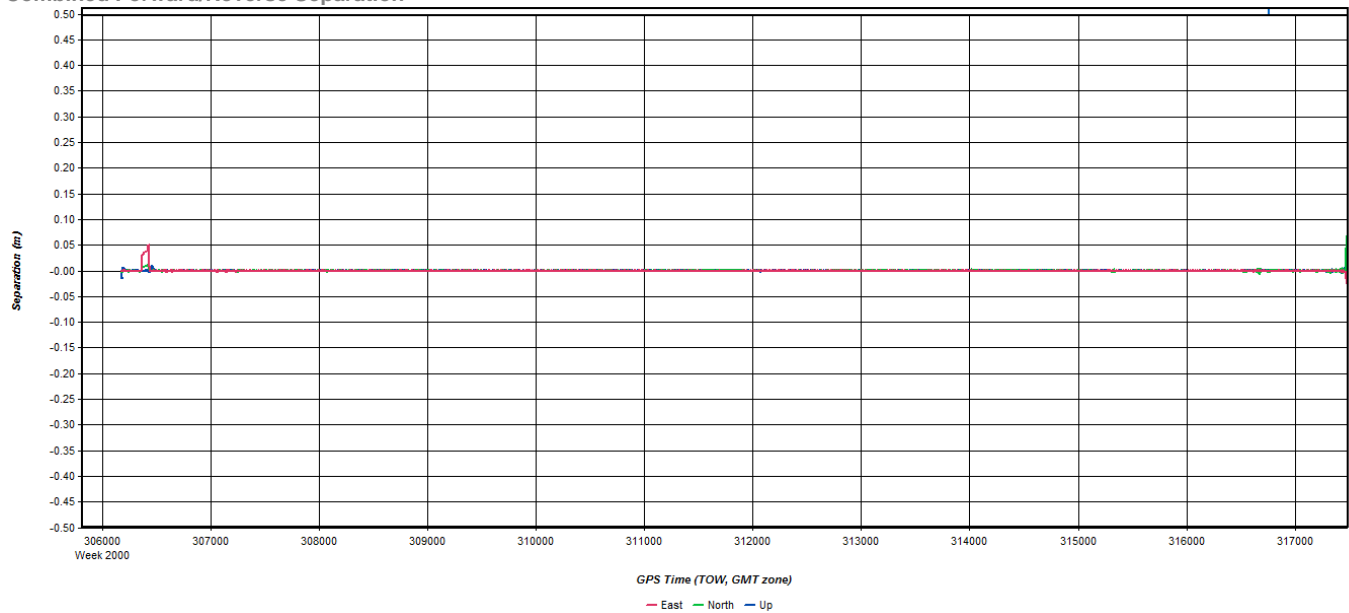


Height

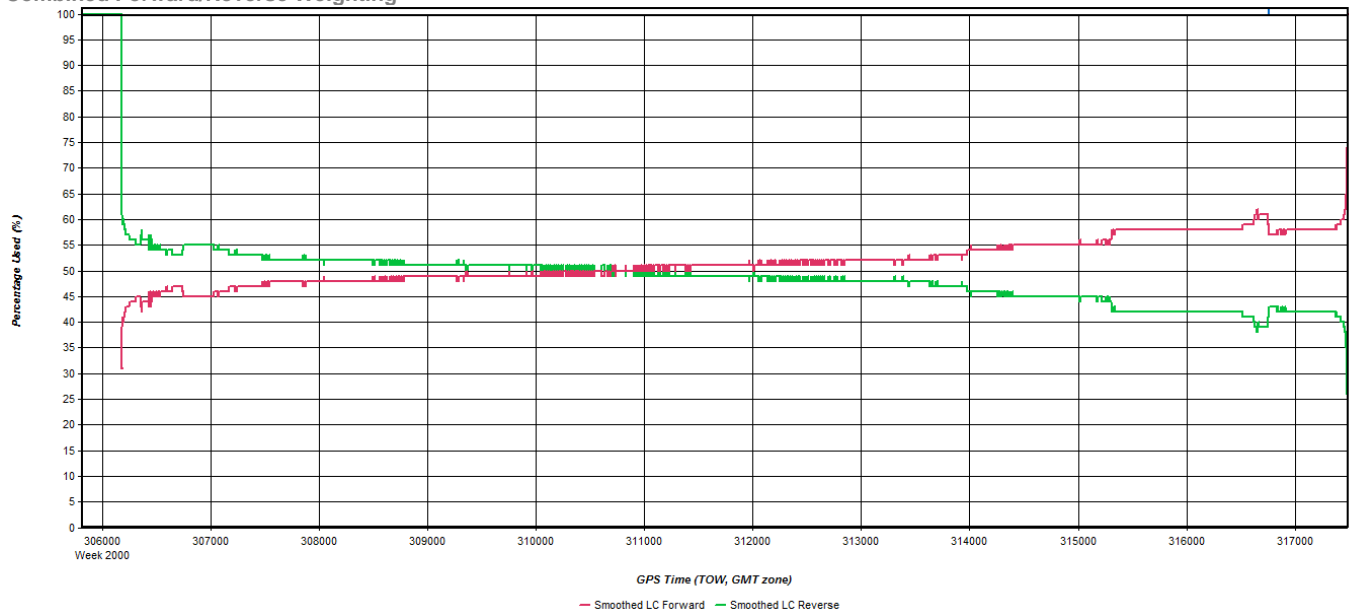


USGS COLLECTION REPORT

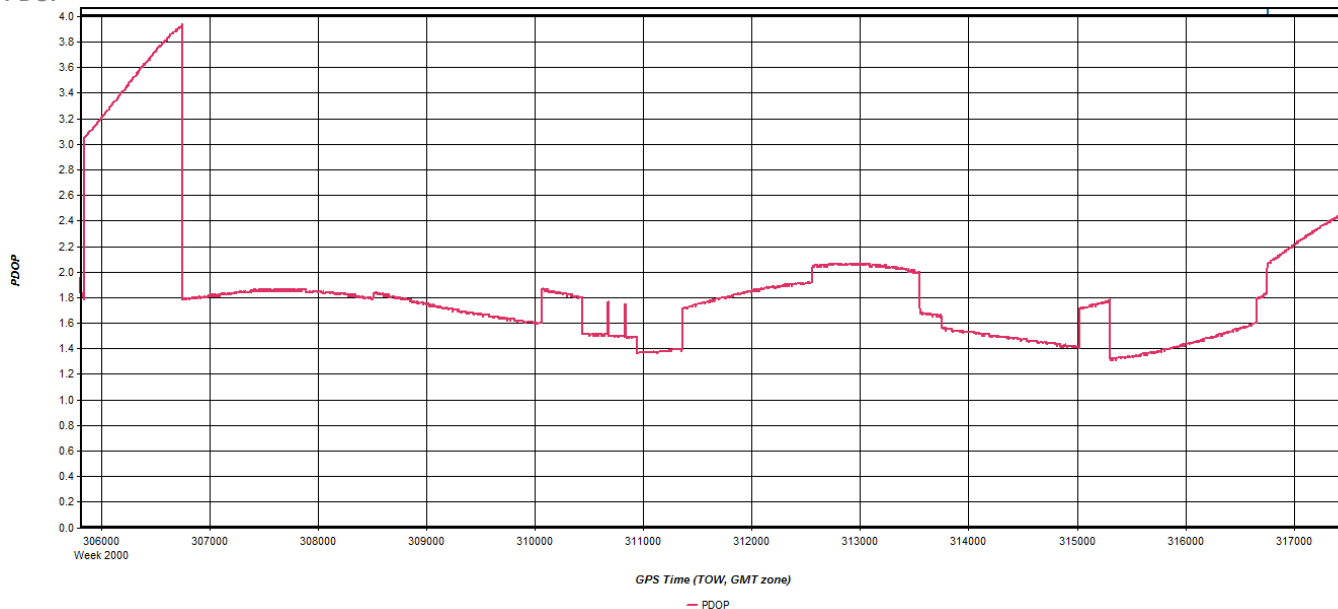
Combined Forward/Reverse Separation



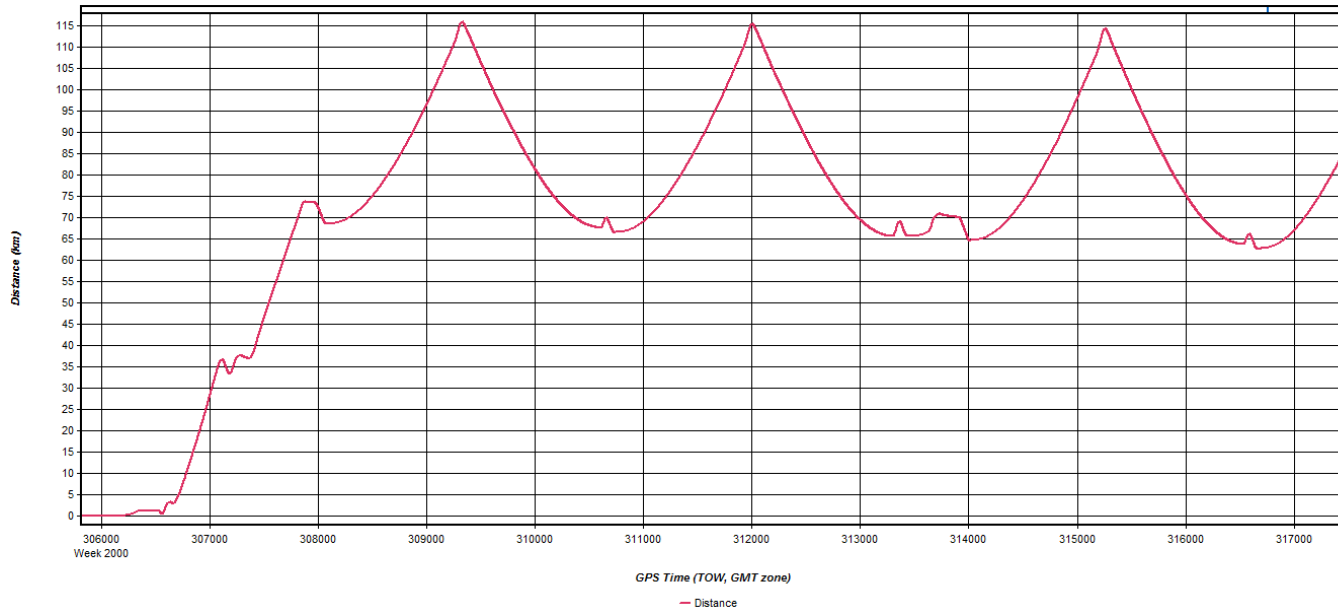
Combined Forward/Reverse Weighting



PDOP



Distance from Base





SVs



**USGS
COLLECTION REPORT**



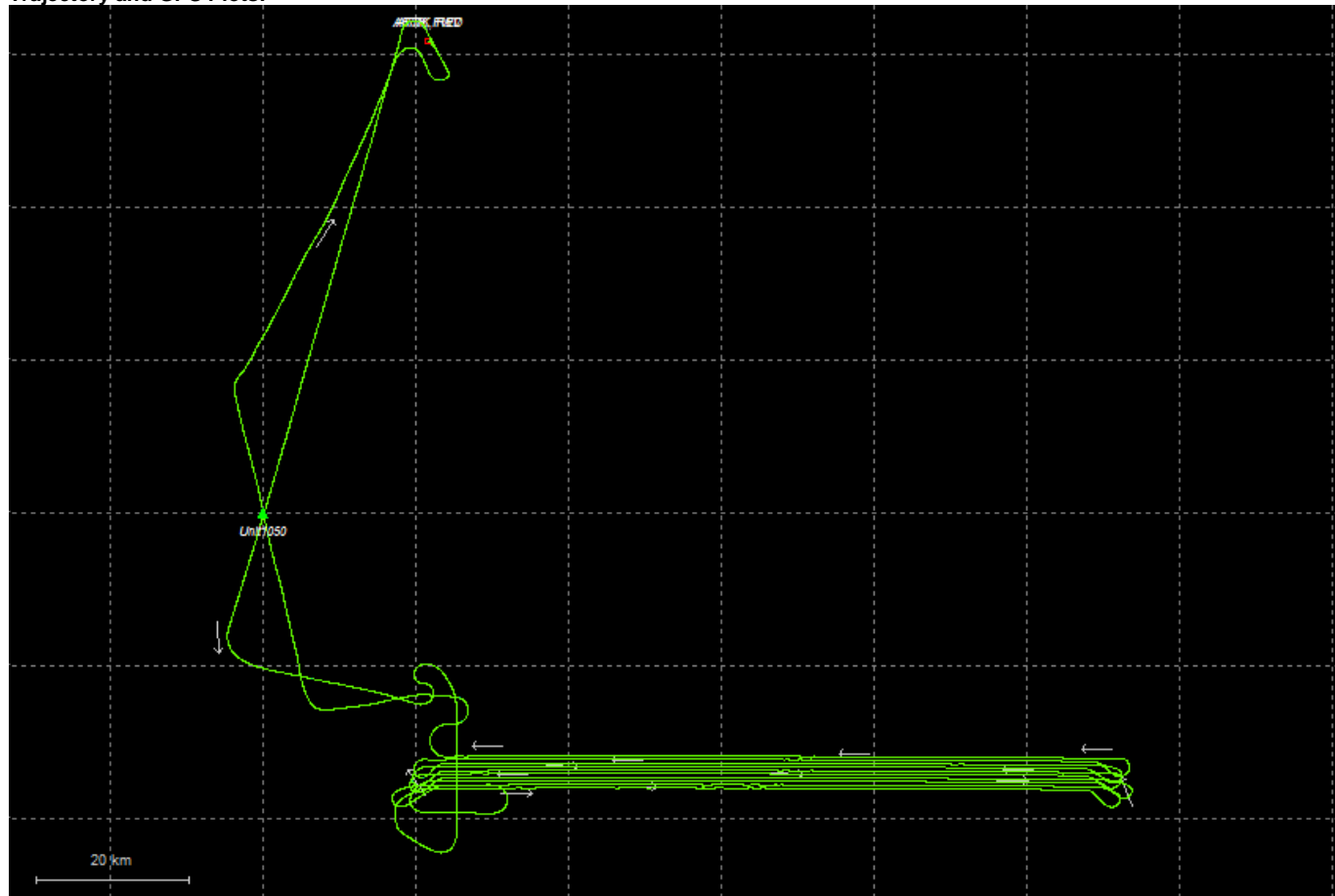
Acquisition and Processing details ----- (May 9, 2018)

Log: 180509_165_33780055_13

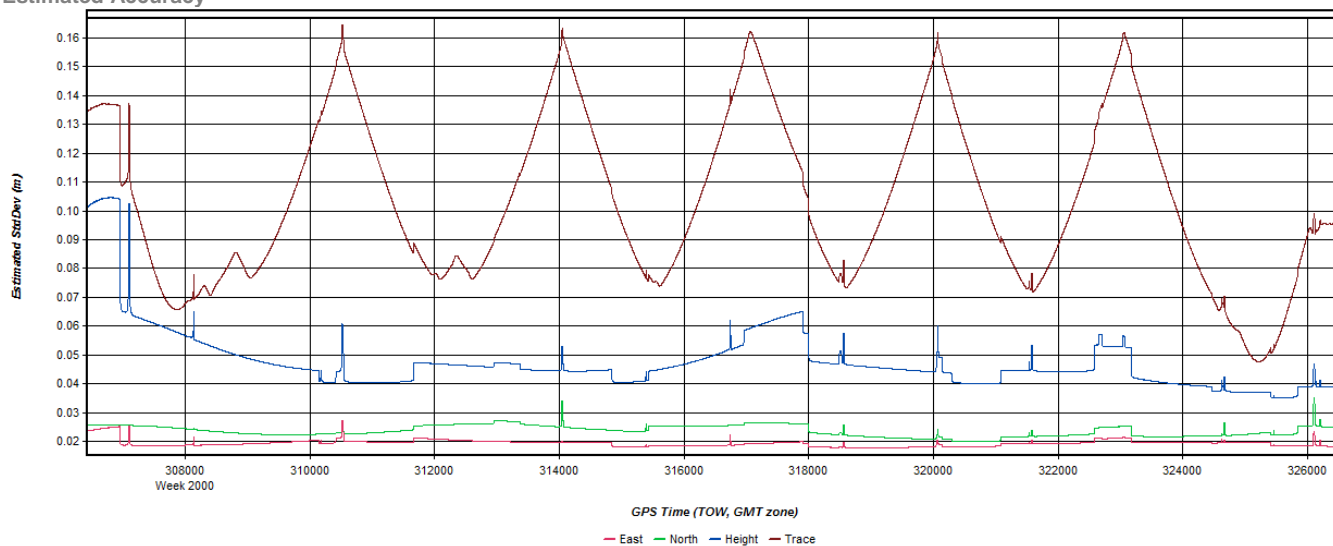
FUGRO		Fugro USA Land, Inc.										Riegl	
												Flight Log	
18.01		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity	AC80-50-00-02	
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs			
1		KRAP	13:02	1064.5	KRAP	18:43	1069.8	5:41	5:75	5:3	0900-Production		
2													
3													

FGI Job # 33780055	Project Name SD USGS FY18			System 680i	Unit 165	IMU FMU-300				Ground Temp °C 15.0 22.0	Min Range' 1542	Data Logger Drives DR680-16-4				
Flight Date 9-May-18	GPS Day 18-129	Lift 13				Sun° N/A	Solar Times (UTC) N/A	Pulse Rate 330	Flying Temp °C 14.0 12.0		Max Range' 2933	Download Drive NS2TB-15				
Mission ID (yyymmdd_Sen_Job_Lift) 180509_165_33780055_13			Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 29.96 29.97	Humidity @ Alt 86%	Shipping Track	
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Eric Mueller			Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3	Ant ID GR3	ARP (m) 1.8	Start Time (UTC) 180509 1220		Stop Time (UTC)	GPS Filename		Operator Riley Forsyth	Data				
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate				
							13:08:02						GROUND-STARTUP @ KRAP		18	1.0
							13:27:36	13:32:36		6,227	192		OVERFLY 7002(REMOTE STATION)		16	1.2
							13:37:00	13:40:00		5,411	154		PRE ACQUISITION CALIBRATION		16	1.2
RIEGL_13E_x	2		60	40	26	17.2	13:42:00	13:45:00	180	5,340	126		CROSS LINE		16	1.2
RIEGL_13E	26		1	189	0	82.7	13:51:00	14:13:00	090	5,340	123				17	1.2
	25		189	1	82.7	0	14:16:00	14:38:00	270	5,340	124				18	1.0
	25		1	10	0	4	14:42:00	14:44:00	090	5,340	123		CALIBRATION LINE		17	1.1
	24		1	189	0	82.7	14:50:00	15:12:00	090	5,340	128				16	1.1
	23		189	1	82.7	0	15:16:00	15:37:00	270	5,340	126				15	1.4
	22		1	189	0	82.7	15:40:00	16:02:00	090	5,340	126				17	1.1
	21		189	1	82.7	0	16:05:00	16:27:00	270	5,340	118				17	1.2
	20		1	189	0	82.7	16:30:00	16:52:00	090	5,340	127				15	1.4
	19		189	1	82.7	0	16:55:00	17:17:00	270	5,290	123				18	1.2
	18		1	189	0	82.7	17:20:00	17:42:00	090	5,290	124				17	1.2
	17		189	1	82.7	0	17:46:00	18:08:00	270	5,290	124				19	1.0
							18:08:15	18:11:00		5,476	118		POST ACQUISITION CALIBRATION		18	1.1
							18:17:42	18:22:42		6,300	164		OVERFLY 7002(REMOTE STATION)		19	1.1
							18:40:00						SHUTDOWN @ KRAP		16	1.3

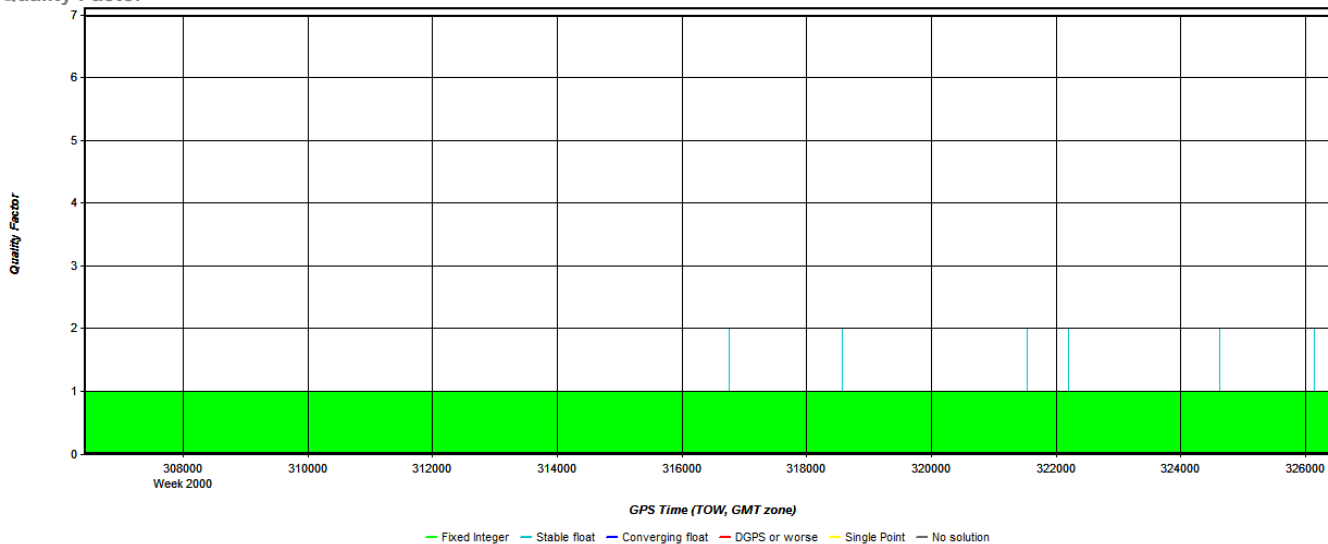
Trajectory and GPS Plots:



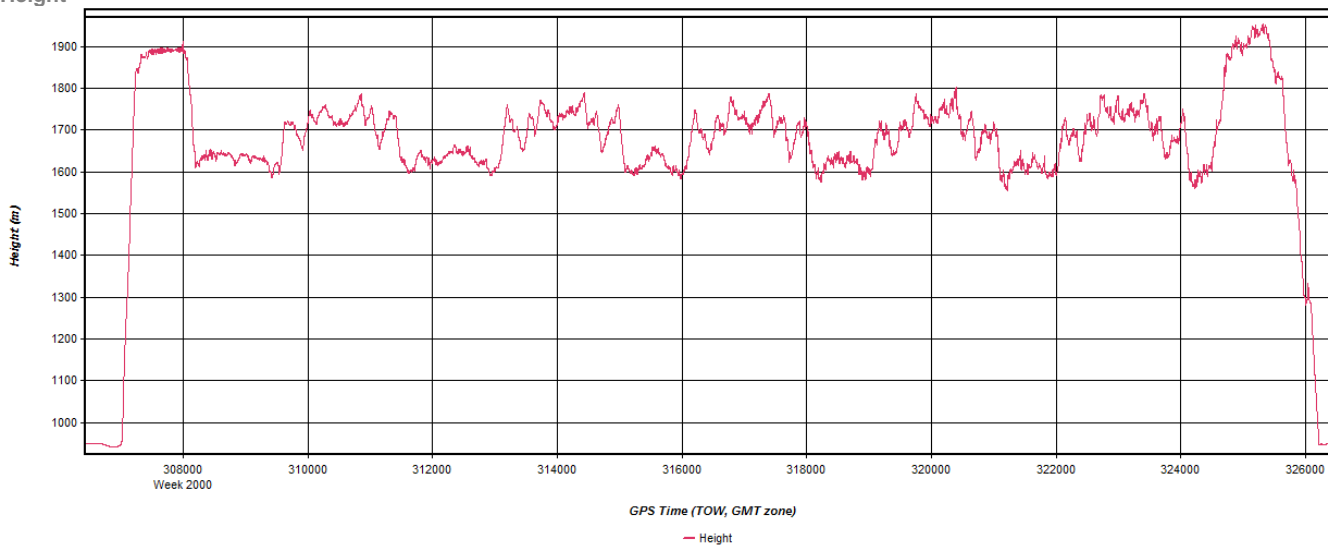
Estimated Accuracy



Quality Factor

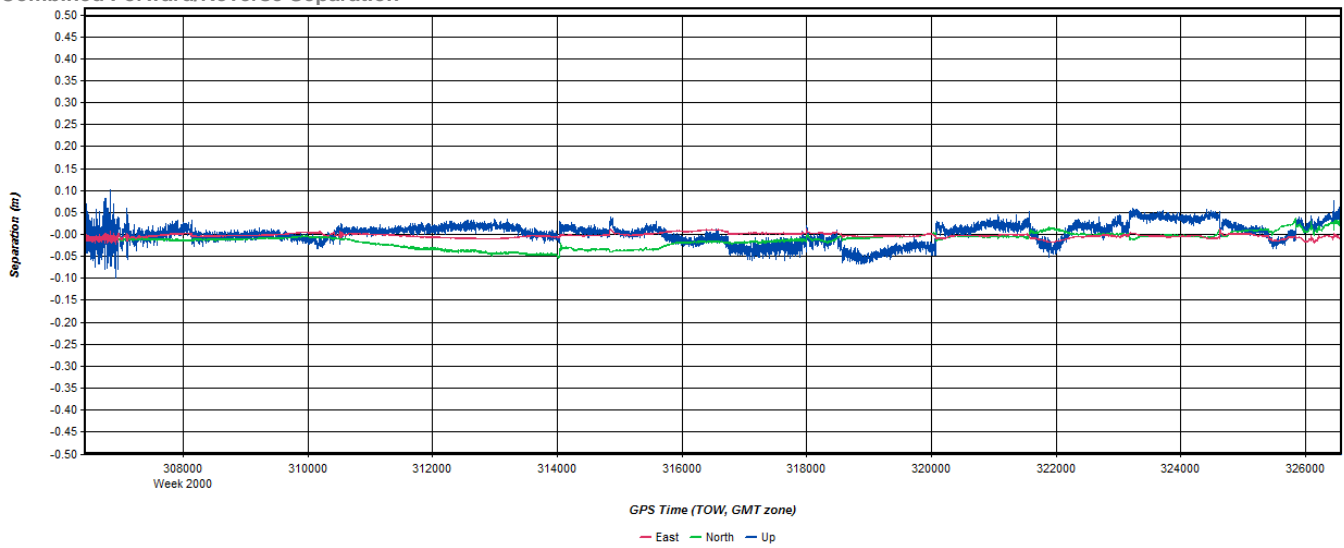


Height

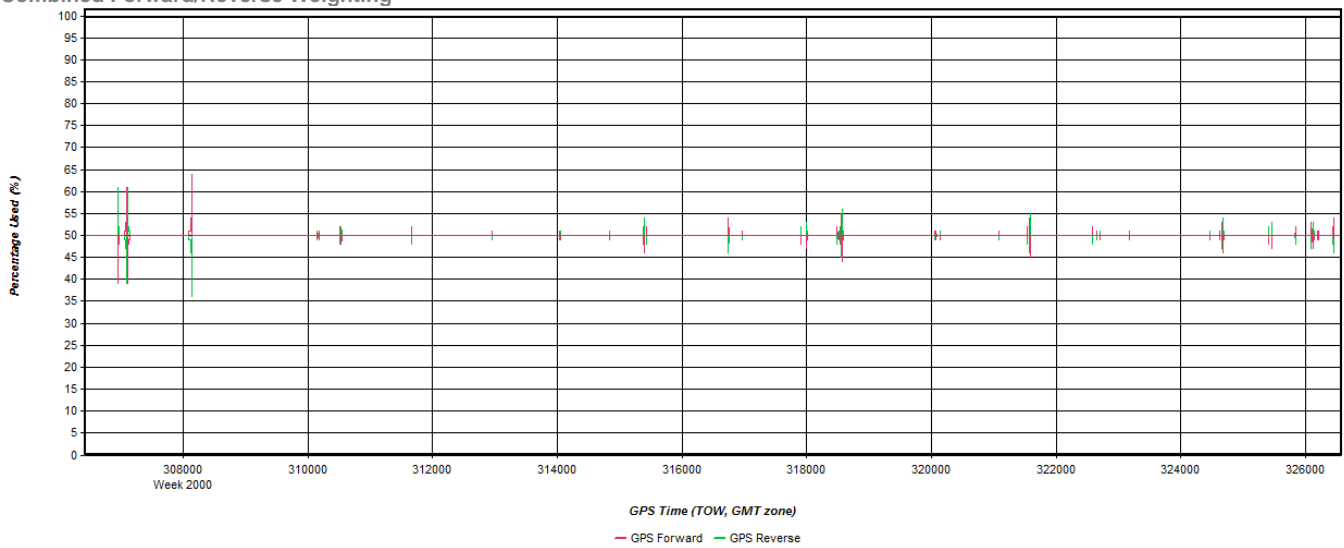


USGS COLLECTION REPORT

Combined Forward/Reverse Separation

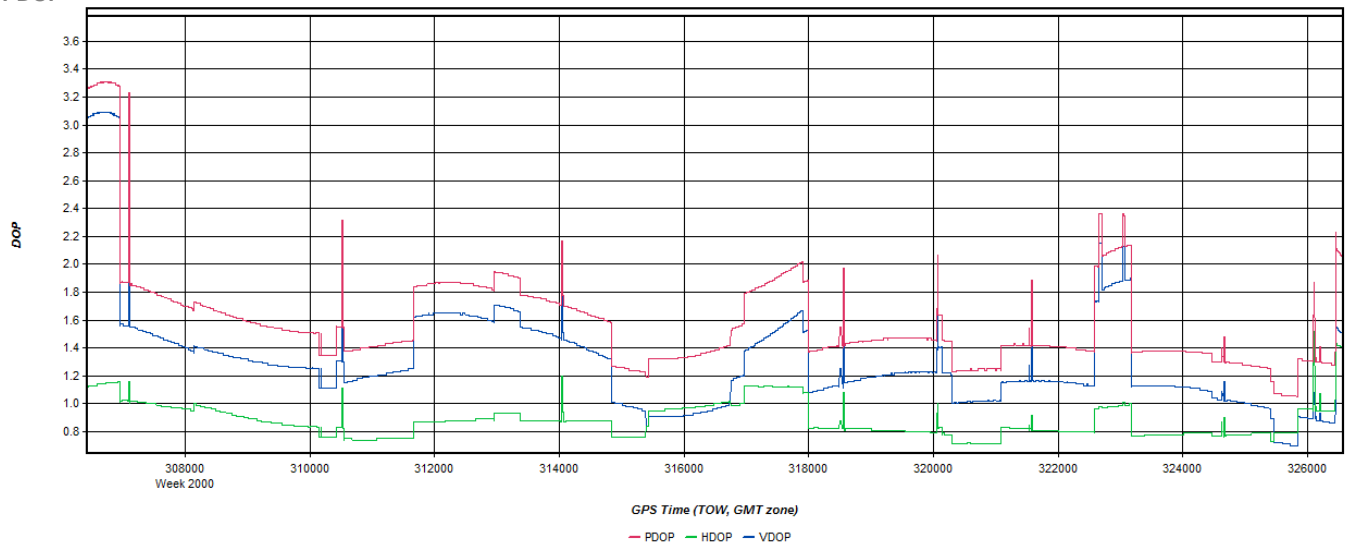


Combined Forward/Reverse Weighting

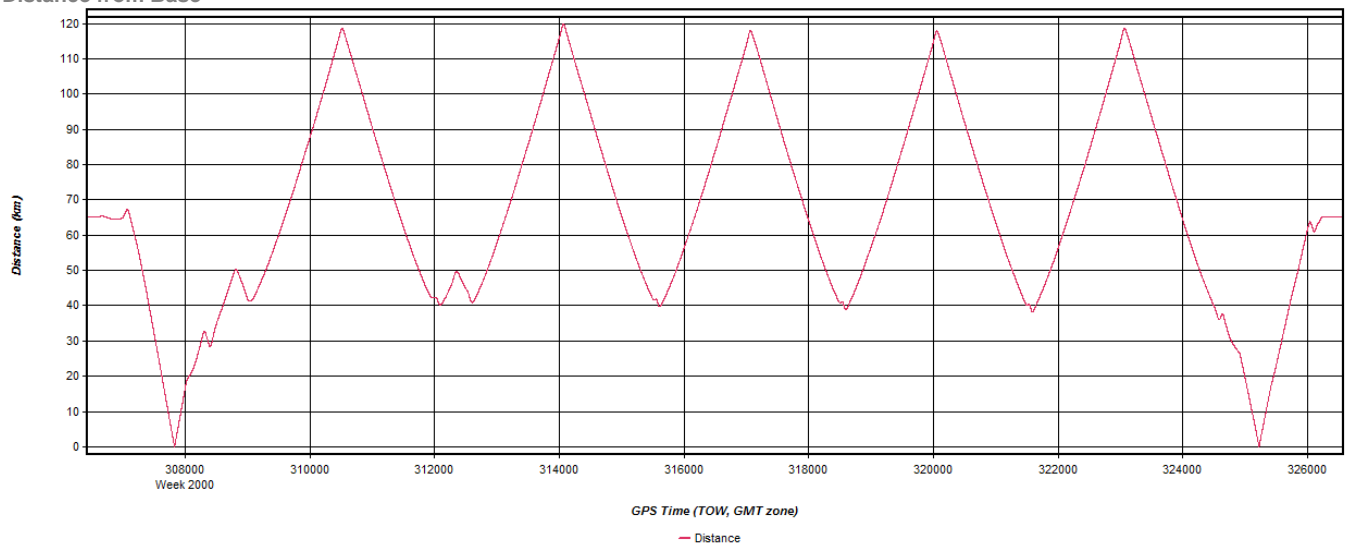


USGS COLLECTION REPORT

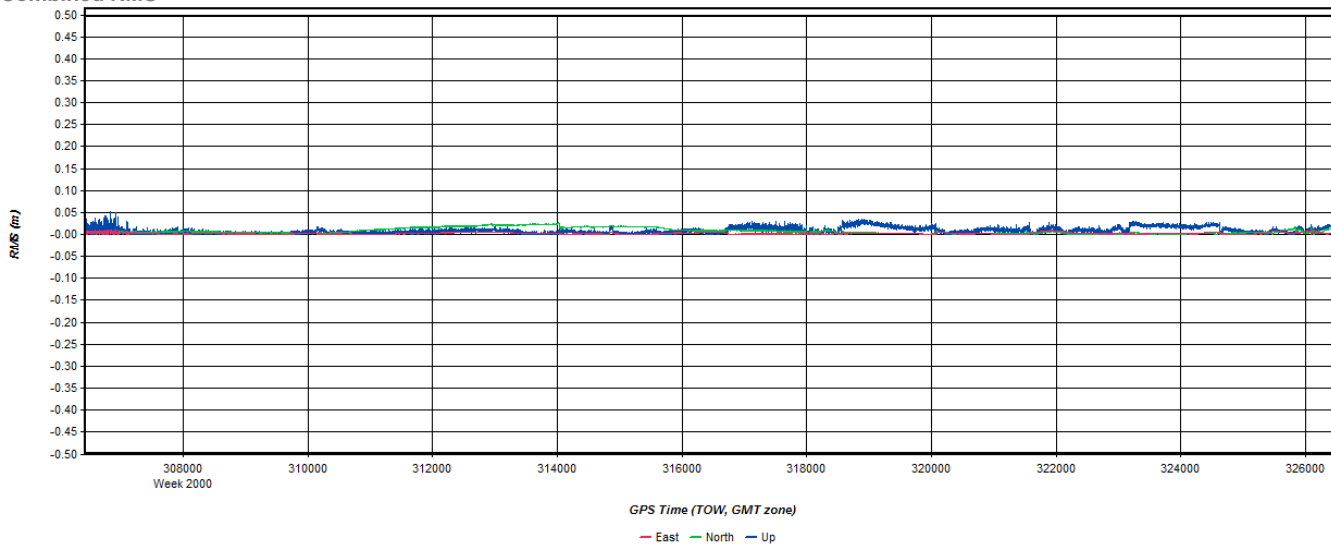
PDOP



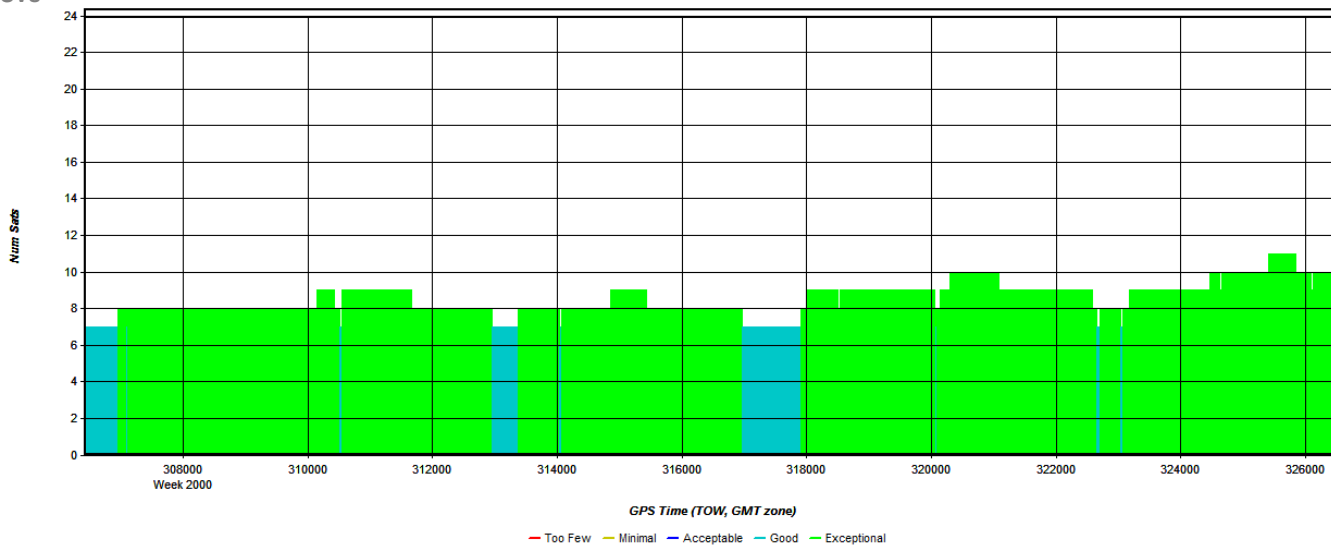
Distance from Base



Combined RMS



SVs



**USGS
COLLECTION REPORT**



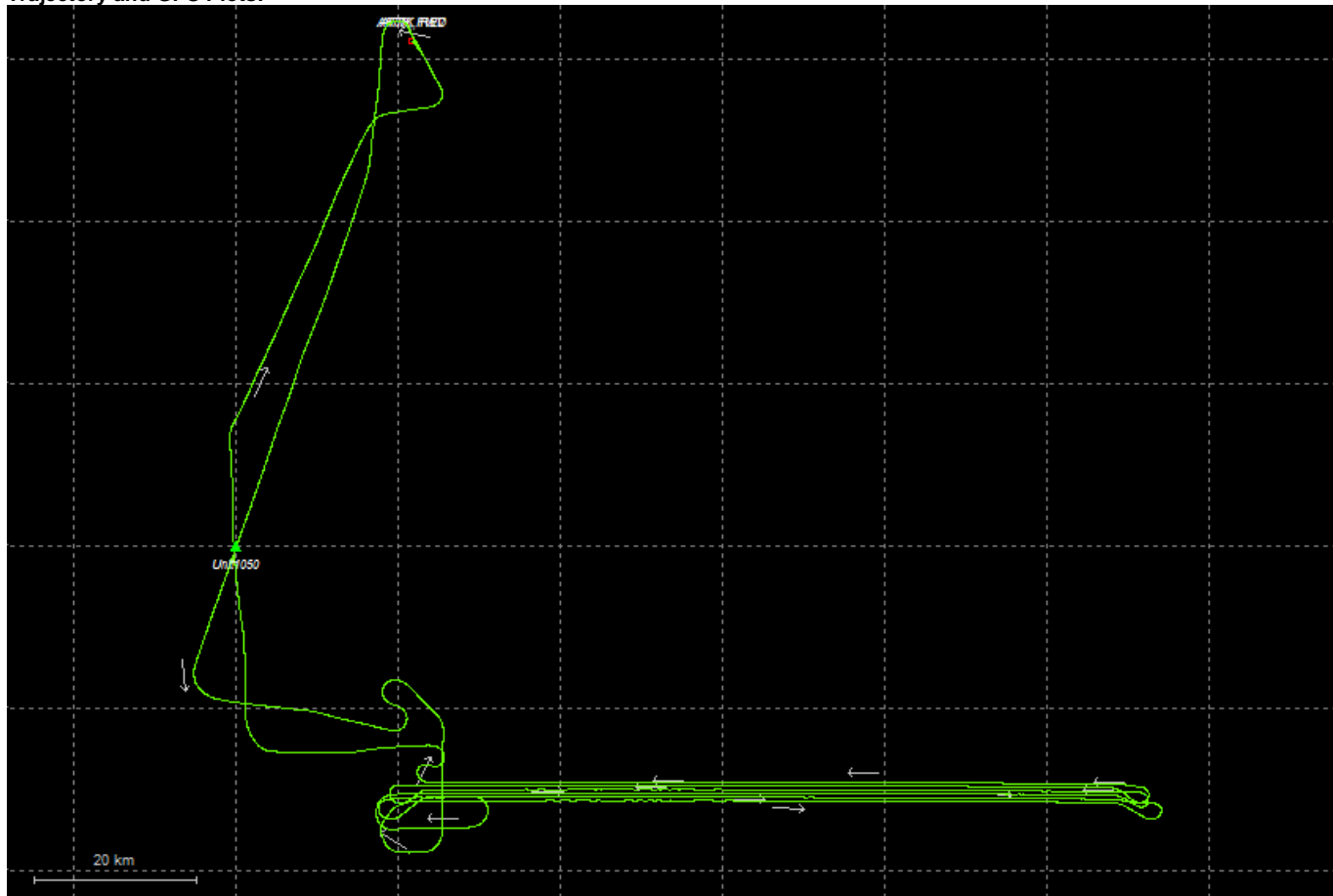
Acquisition and Processing details ----- (May 9, 2018)

Log: 180509_165_33780055_14

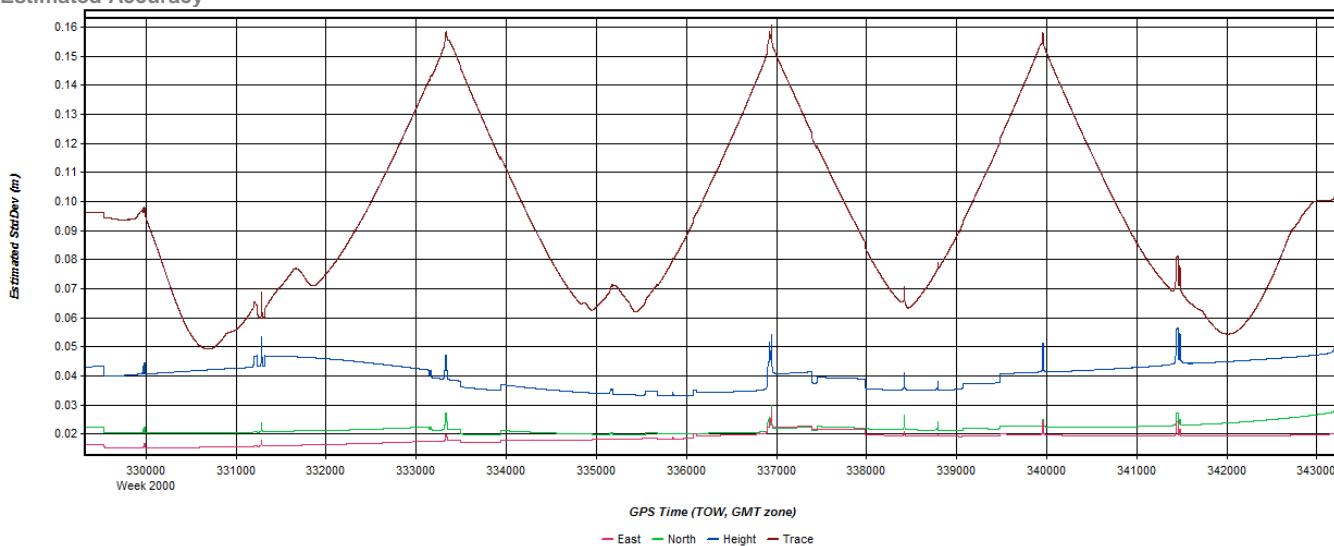
18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	19:24	1069.8	KRAP	23:22	1073.5	3:58	4.00	3.7	0900-Production
2										
3										

Fugro USA Land, Inc.		Riegl Flight Log AC80-50-00-02													
FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU FMU-300	Ground Temp °C 22.0 22.0		Min Range' 1542		Data Logger Drives DR680-20					
Flight Date 9-May-18	GPS Day 18-129	Lift 14	Sun° N/A		Solar Times (UTC) N/A		Pulse Rate 330		Flying Temp °C 14.0 14.0		Max Range' 2933	Download Drive NS2TB-15			
Mission ID (yyymmdd_Sen_Job_Lift) 180509_165_33780055_14		Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	Altitude Setting 29.96 29.95	Humidity @ Alt 55%	Shipping Track	
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Eric Mueller		Operator #2									
Base 1 ID 7002	Location Buffalo Gap, SD		Rec ID GR3	Ant ID GR3	ARP (m) 1.8	Start Time (UTC) 180509 1220	Stop Time (UTC)	GPS Filename	Operator Riley Forsyth		Data				
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							19:29:44						STARTUP @ KRAP	15	1.5
							19:48:48	19:53:48		6,317	183		OVERFLY 7002(REMOTE BASE)	19	1.2
							19:59:00	20:02:00		5,430	141		PRE ACQUISITION CALIBRATION	19	1.2
RIEGL_13E_x	2		65	50	28.2	21.6	20:04:00	20:06:00	180	5,340	121		CROSS LINE	19	1.1
RIEGL_13E	16		1	189	0	82.7	20:11:00	20:33:00	090	5,290	125			18	1.2
	15		189	1	82.7	0	20:37:00	20:59:00	270	5,290	122			18	1.0
	15		1	10	0	4	21:03:00	21:05:00	090	5,290	124		CALIBRATION LINE	18	1.0
	14		1	189	0	82.7	21:11:00	21:33:00	090	5,290	122			19	1.0
	13		189	1	82.7	0	21:36:00	21:58:00	270	5,340	122			17	1.0
	12		1	189	0	82.7	22:02:00	22:23:00	090	5,340	122			17	1.1
	11		189	1	82.7	0	22:27:00	22:48:00	270	5,340	126			17	1.2
							22:49:00	22:51:00		5,404	119		POST ACQUISITION CALIBRATION	16	1.0
							22:57:30	23:02:30		6,236	170		OVERFLY 7002(REMOTE BASE)	16	1.1
							23:19:00						SHUTDOWN @ KRAP	16	1.2

Trajectory and GPS Plots:

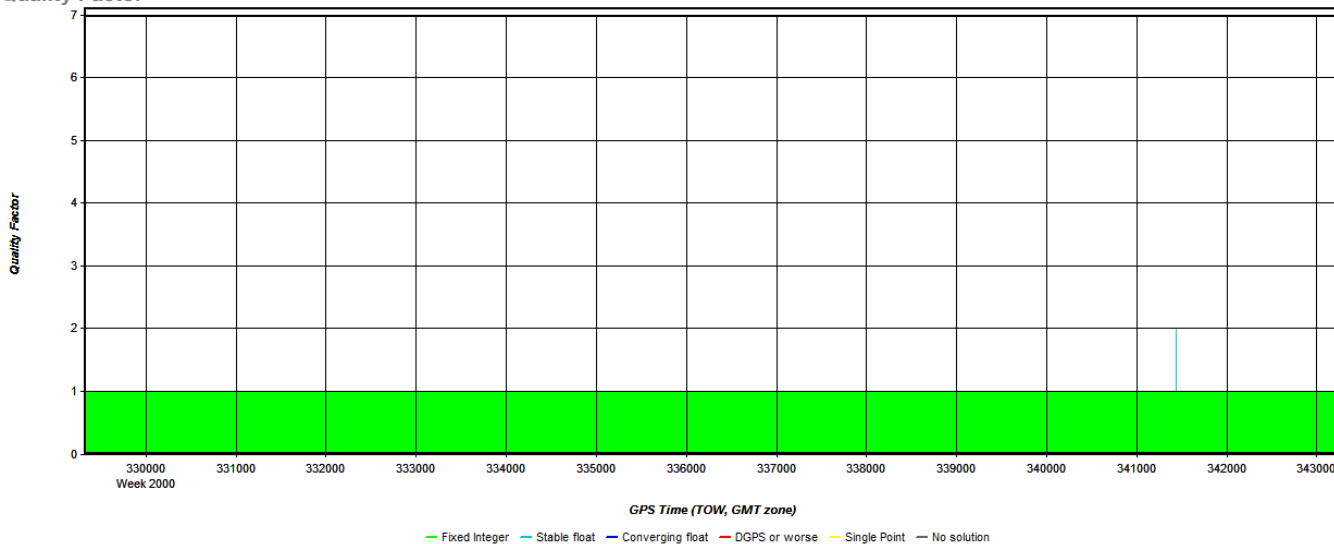


Estimated Accuracy

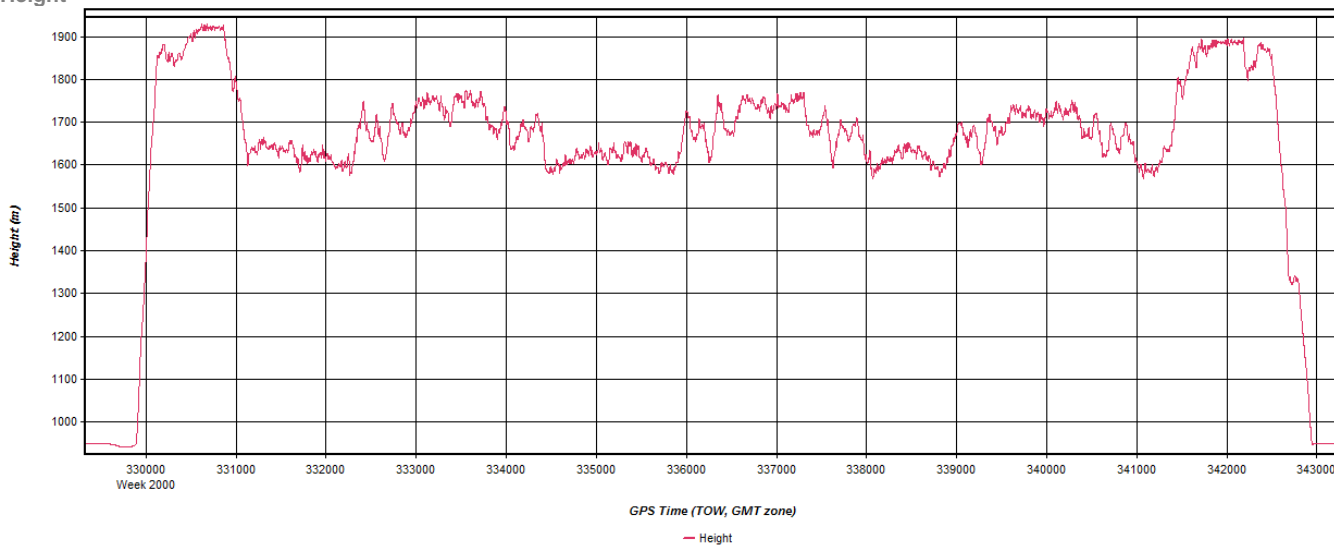




Quality Factor

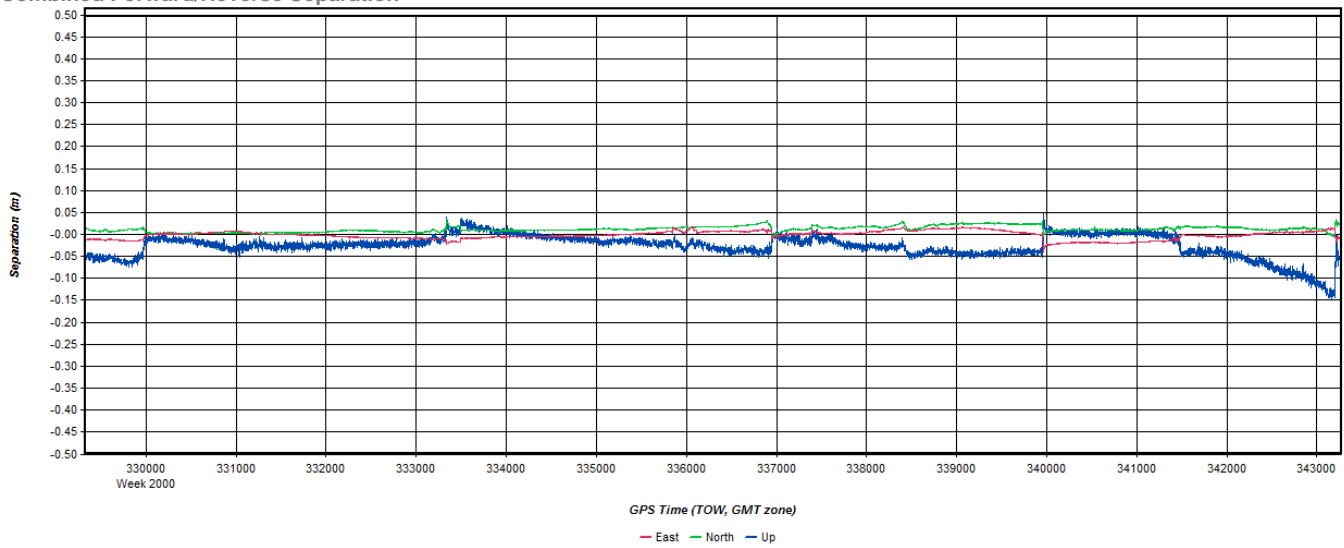


Height

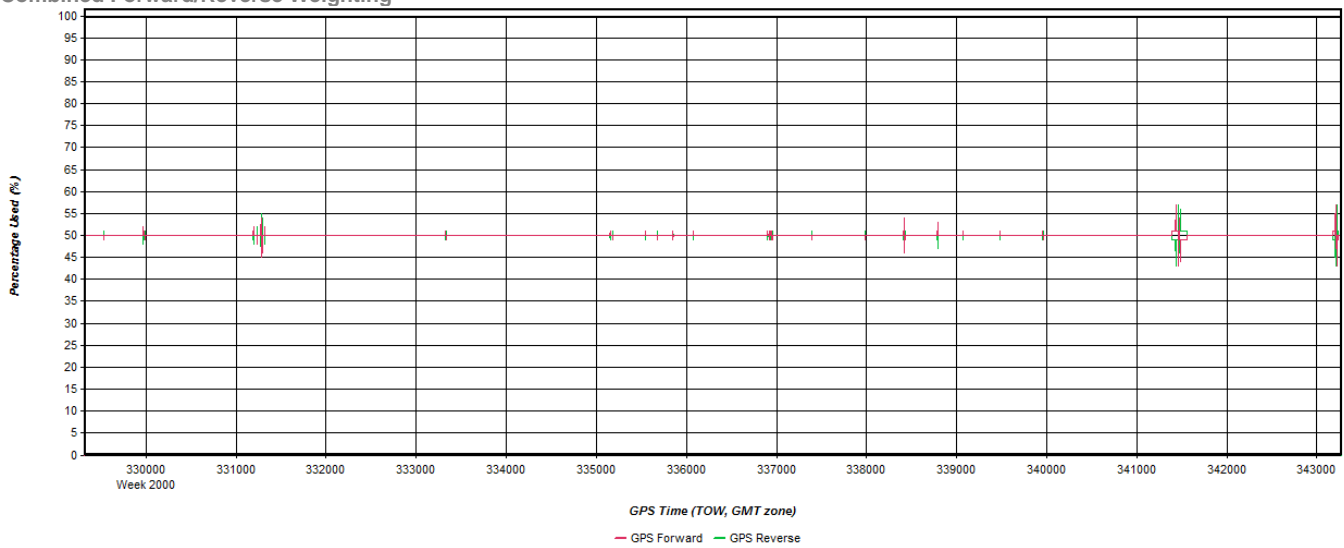


USGS COLLECTION REPORT

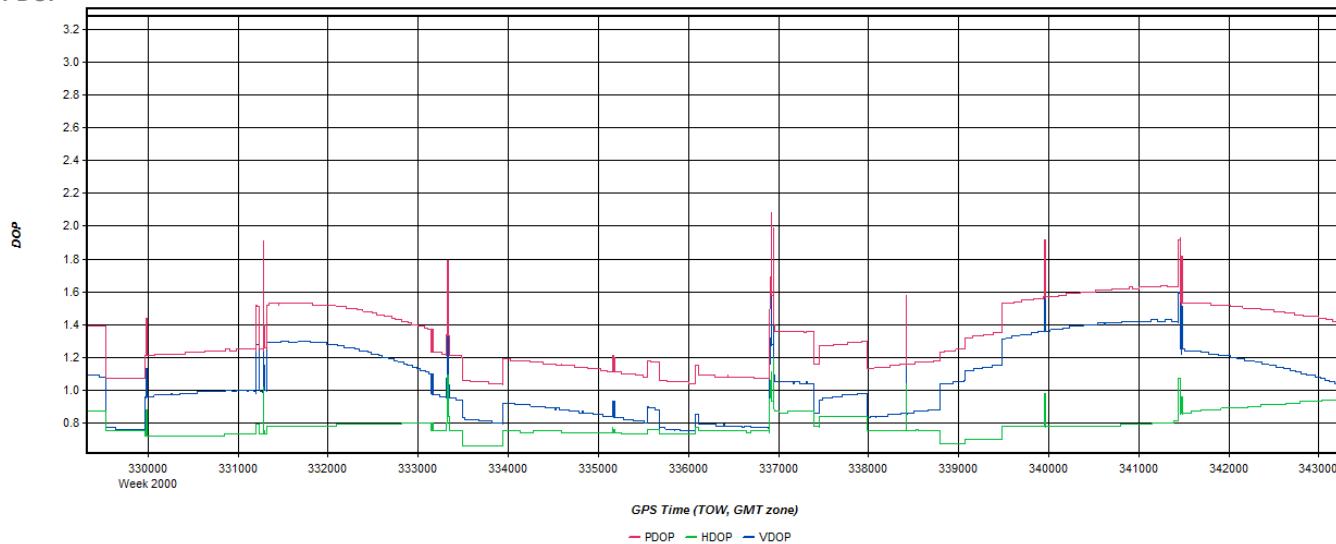
Combined Forward/Reverse Separation



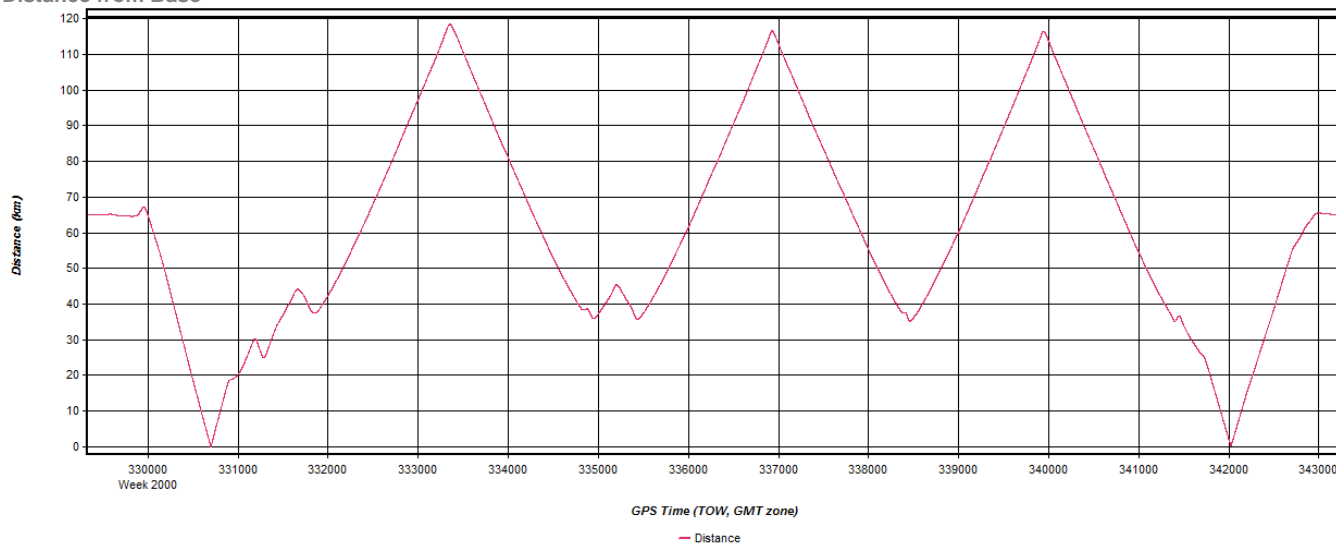
Combined Forward/Reverse Weighting



PDOP

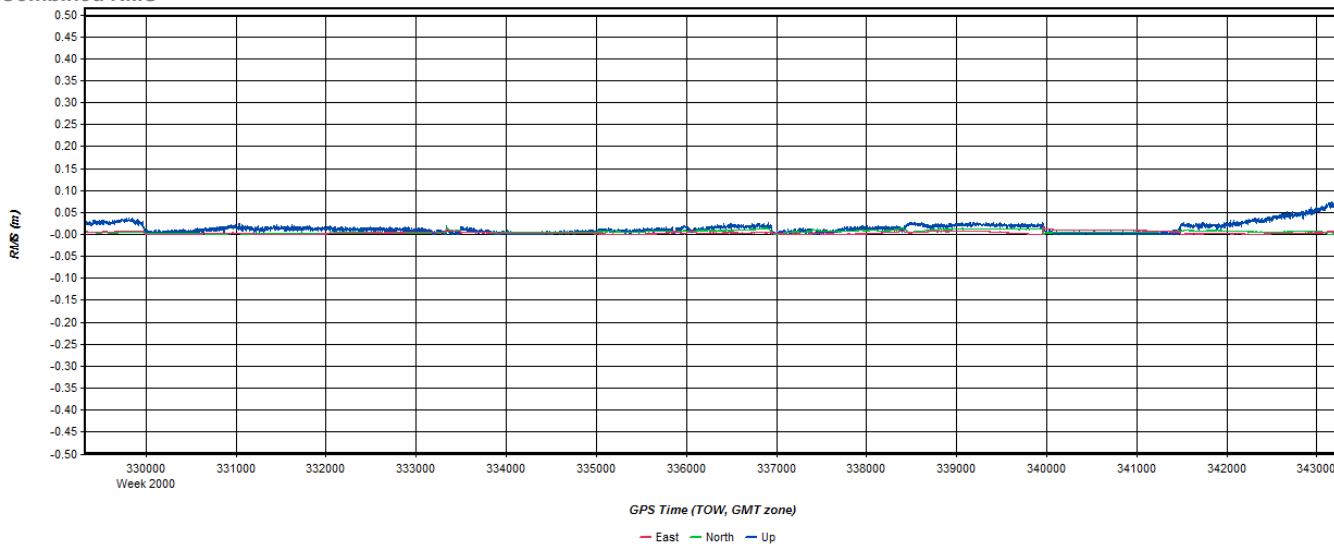


Distance from Base

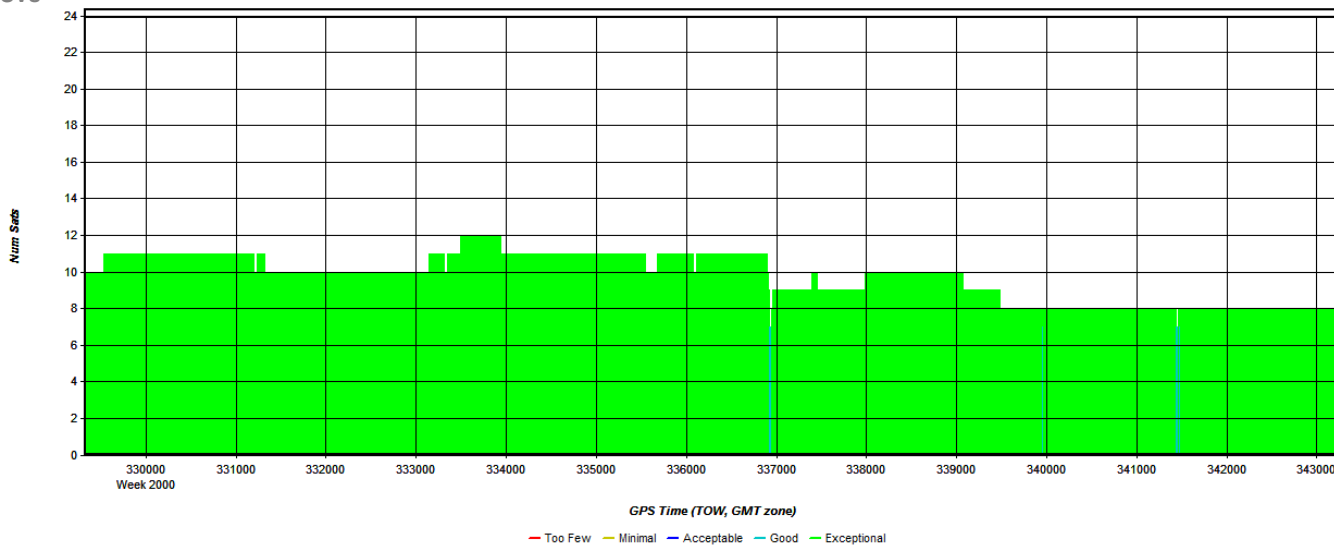




Combined RMS



SVs



**USGS
COLLECTION REPORT**



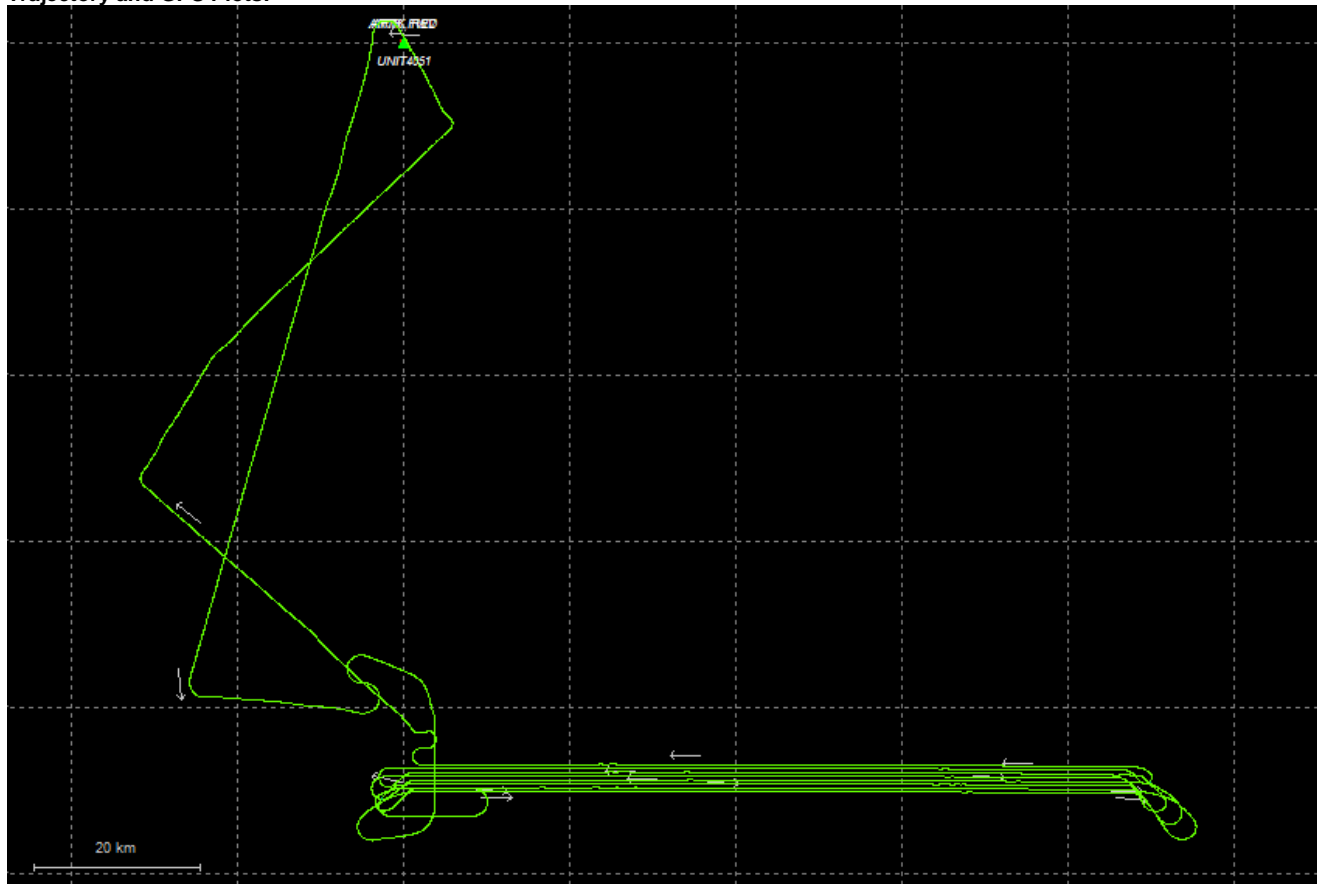
Acquisition and Processing details ----- (May 14, 2018)

Log: 180514_165_33780055_15

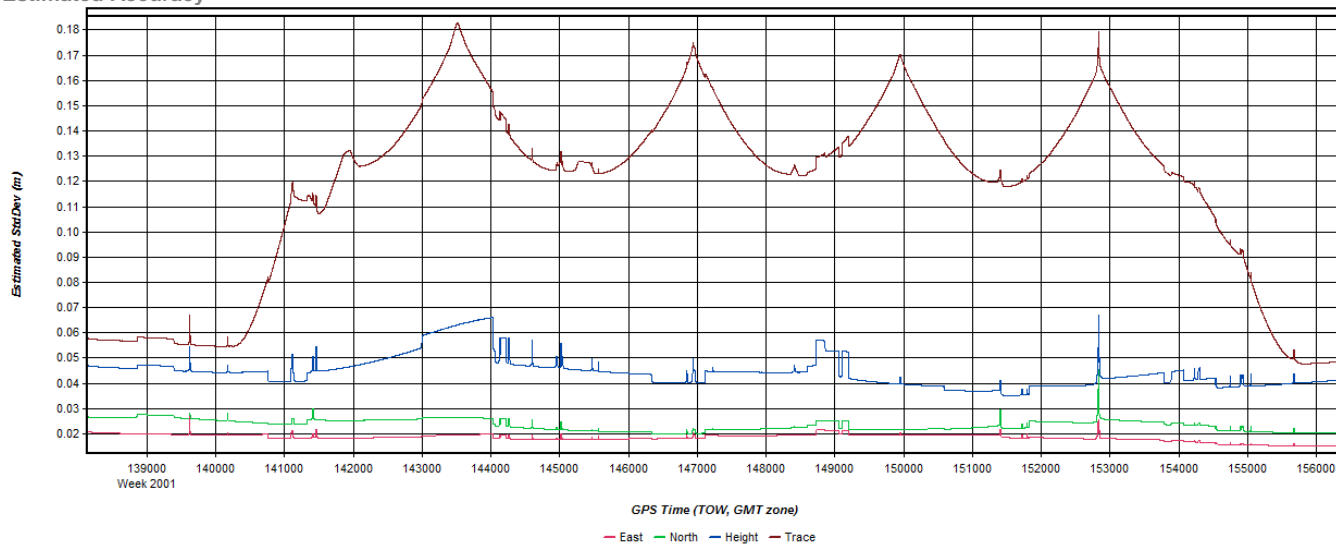
FUGRO		Fugro USA Land, Inc.										Riegl	
												Flight Log	
18.01												AC80-50-00-02	
Lift Begin			Lift End			Flt	Flt	Hobbs	Activity				
Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs					
1	KRAP	14:31	1073.5	KRAP	19:27	1077.8	4:56	5.00	4.3	0900-Production			
2													
3													

FGI Job # 33780055	Project Name SD USGS FY18		System 680i	Unit 165	IMU FMU-300					Ground Temp °C 16.0 18.0	Min Range' 1542	Data Logger Drives CRU			
Flight Date 14-May-18	GPS Day 18-134	Lift 15		Sun° -	Solar Times (UTC) -	Pulse Rate 330				Flying Temp °C 10.0 12.0	Max Range' 2933	Download Drive 10TBBU01; NS1TB98			
Mission ID (yyymmdd_Sen_Job_Lift) 180514_165_33780055_15		Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC -	AMT (ft) 2400	Speed 130	FOV -	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	Altitude Setting 30.05 30.02	Humidity @ Alt -	Shipping Track NA	
Pilot #1 Randy Green		Pilot #2 John Coleman		Operator #1 Chris Acuña		Operator #2 -									
Base 1 ID FGI 081	Location KRAP		Rec ID GR3#4	Ant ID GR3#4	ARP (m) 1.8	Start Time (UTC) 14-May-18 13:04	Stop Time (UTC) 14-May-18 20:34	GPS Filename UNIT40514n	Operator Chris Fought	Data With AB					
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
						14:38:35	14:43:35						5 Min GND static alignment at KRAP	-	-
						15:06:03	15:11:03						Base Station acquisition FGI 7002 (Buffalo Gap)	9	1.1
						15:15:00	15:18:00						S-Turn in flight alignment	9	1.1
RGL_13EX	2		78	60		15:21:00	15:23:00	170	-	131			Crossing Line	9	1.1
RGL_13_E	10		1	189		15:28:00	15:49:00	1	5,302	133				8	1.2
	9		189	1		15:54:00	16:15:00	261	5,643	131				9	1.1
	9		1	10		16:18:00	16:19:00	1	5,440	132			Calibration Line	9	1.2
	8		1	189		16:25:00	16:46:00	2	5,310	132				9	1.2
	7		189	1		16:51:00	17:12:00	262	5,775	132			Lt Turb	10	1.0
	6		1	189		17:15:00	17:36:00	29	5,614	127			Lt Turb	10	1.0
	5		188	1		17:41:00	18:01:00	260	5,647	121			Lt Turb	10	1.1
	4		1	188		18:05:00	18:25:00	2	5,500	133			Lt Turb	11	1.0
	3		188	1	82.3 0	18:28:00	18:49:00	263	5,584	125			Lt Turb	10	1.1
						18:49:00	18:51:00						S-Turn post in flight alignment	11	1.0
						18:56:47	19:01:47						Post Base Station acquisition FGI 7002 (Buffalo Gap)		
						19:20:32	19:25:32						5 Min post GND static alignment at KRAP		

Trajectory and GPS Plots:

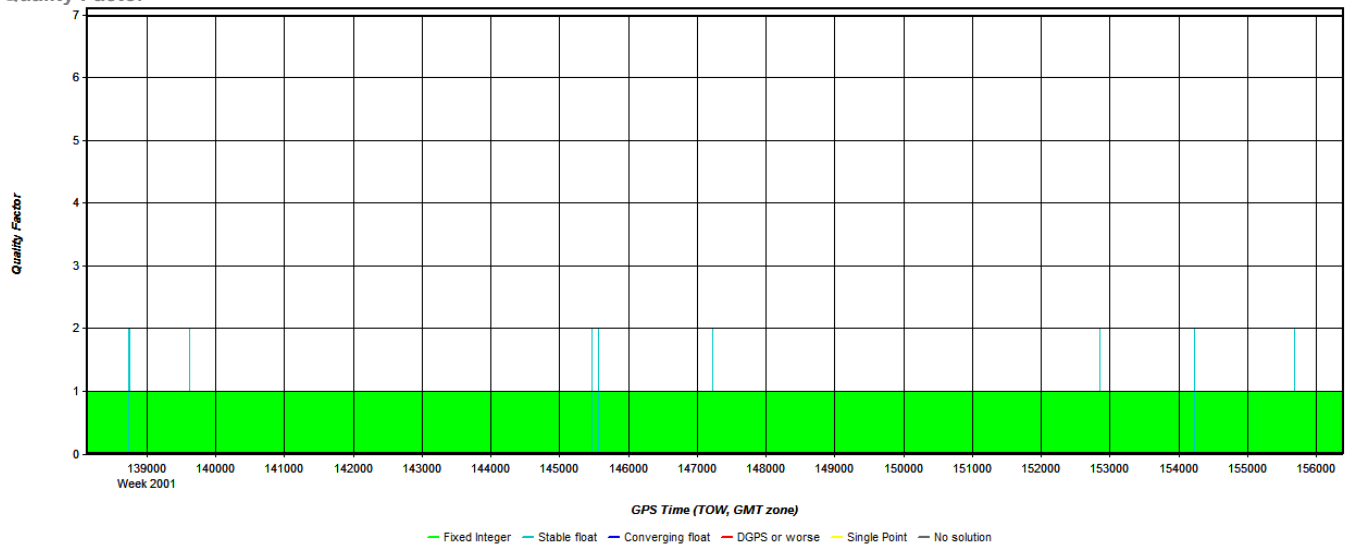


Estimated Accuracy

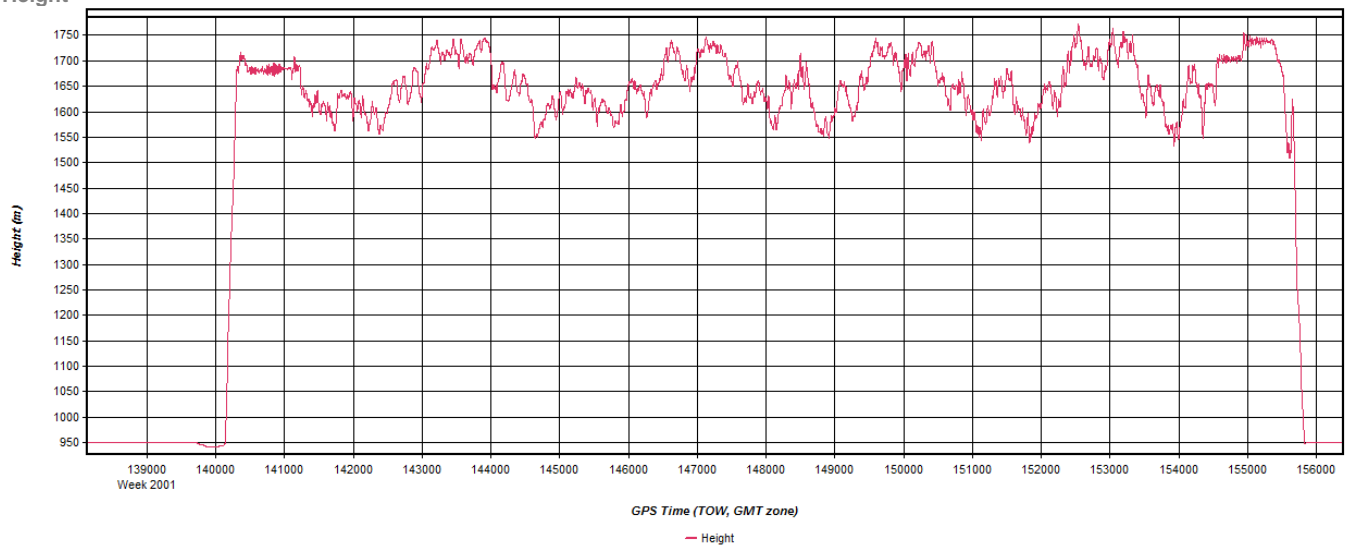


USGS COLLECTION REPORT

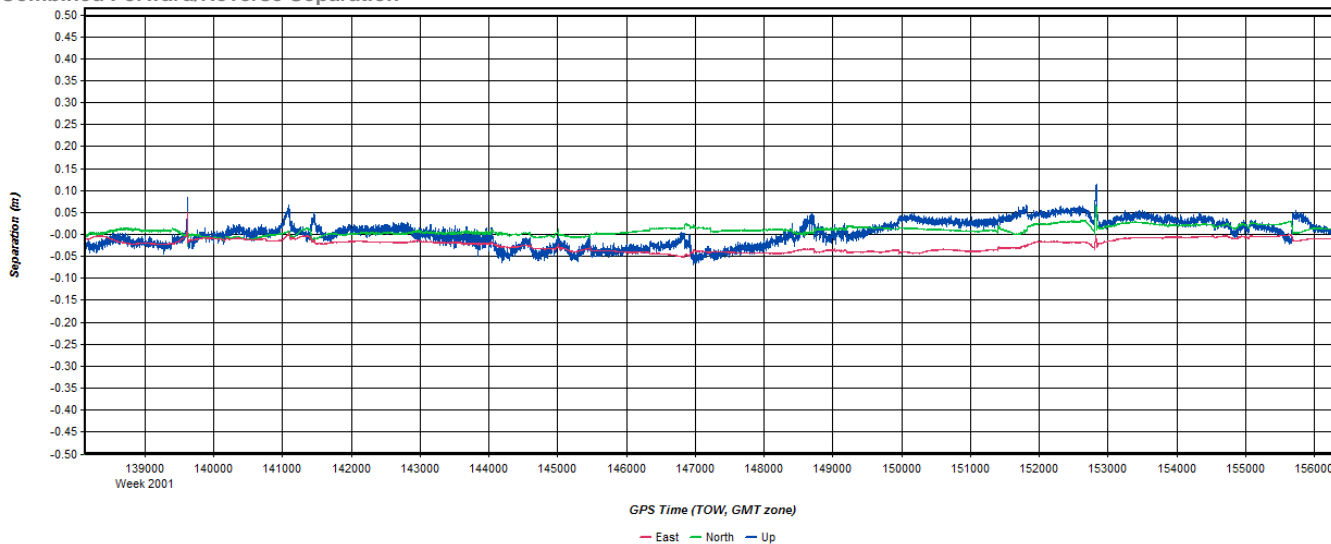
Quality Factor



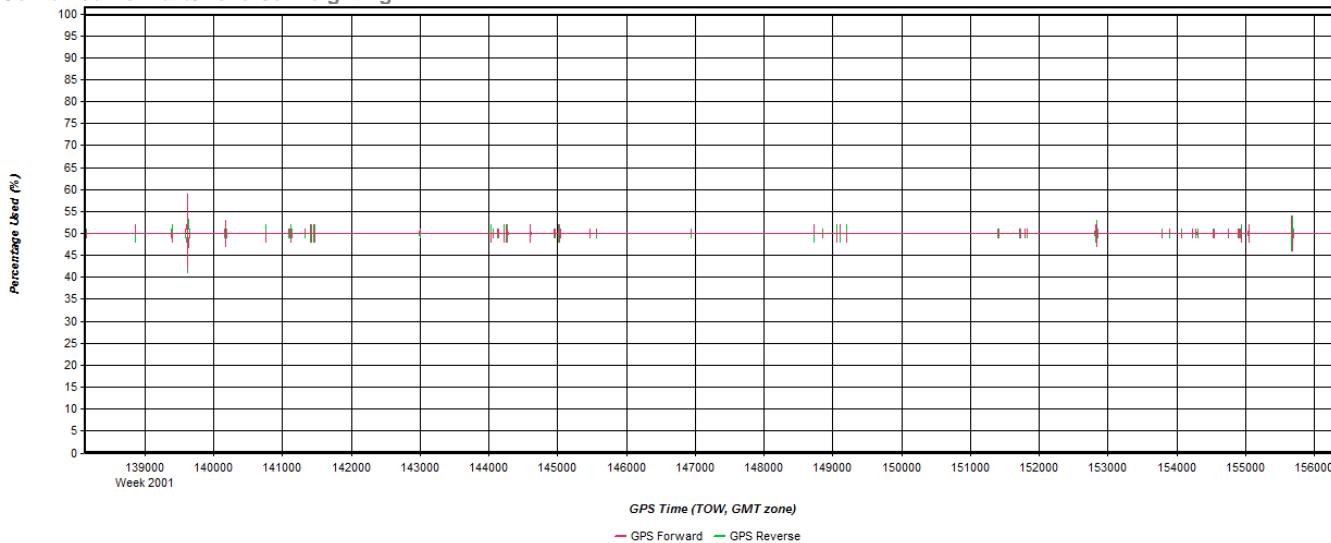
Height



Combined Forward/Reverse Separation

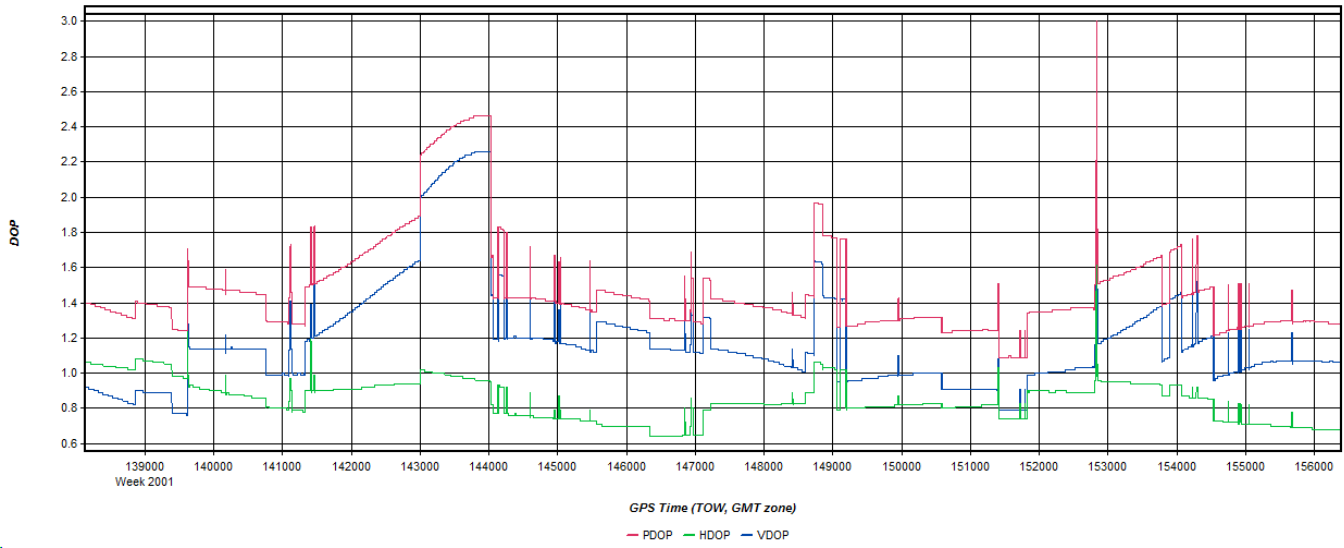


Combined Forward/Reverse Weighting

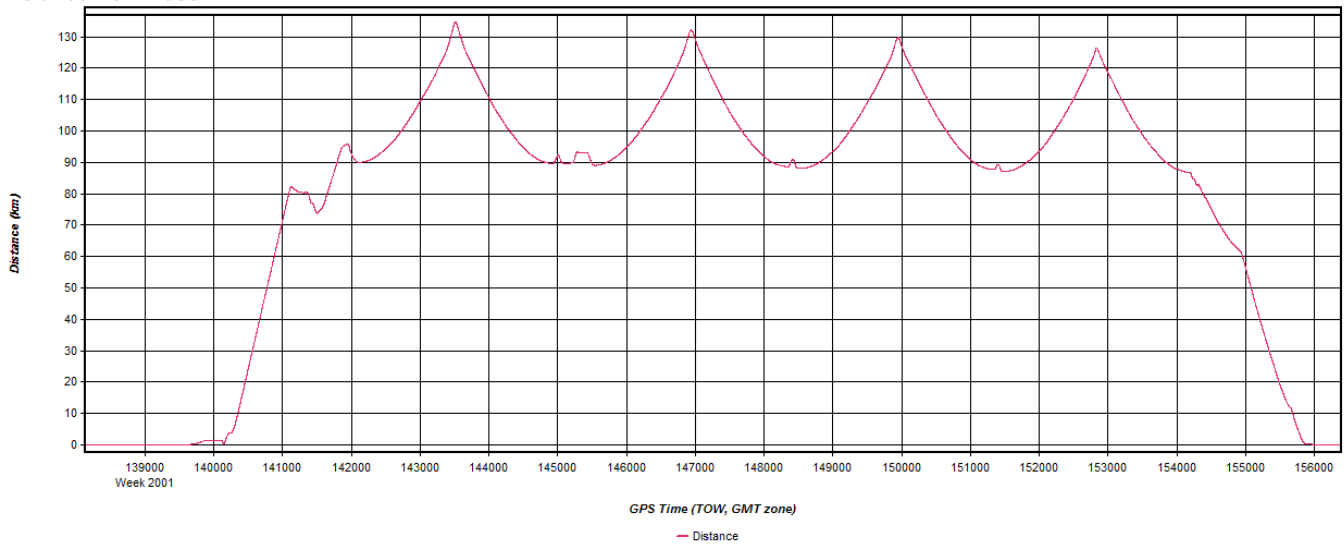


USGS COLLECTION REPORT

PDOP

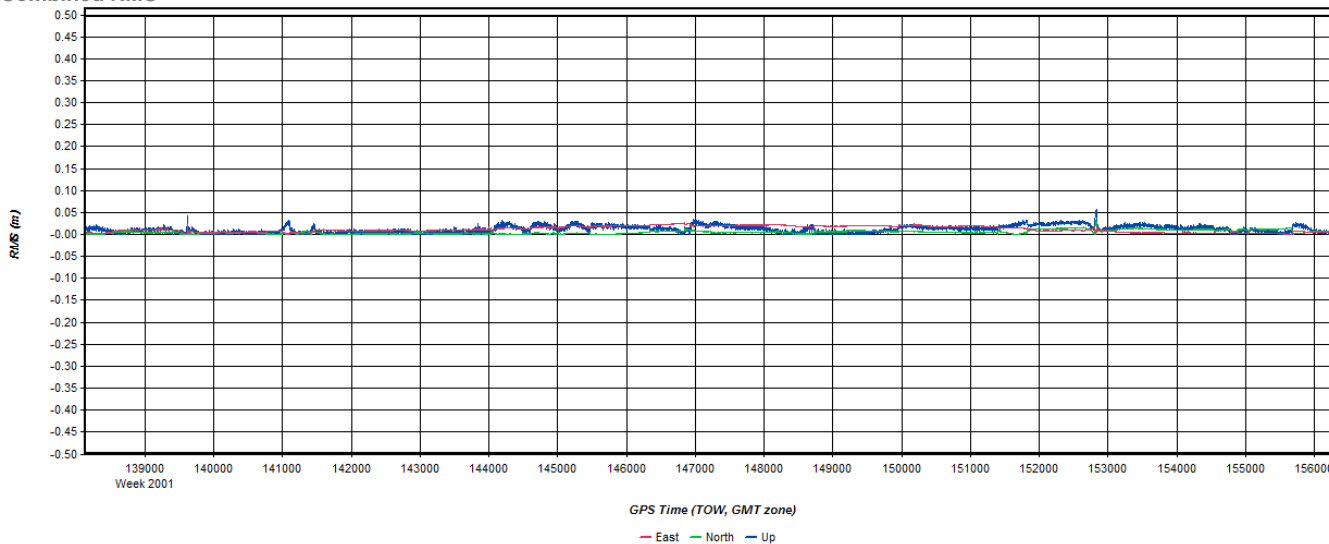


Distance from Base

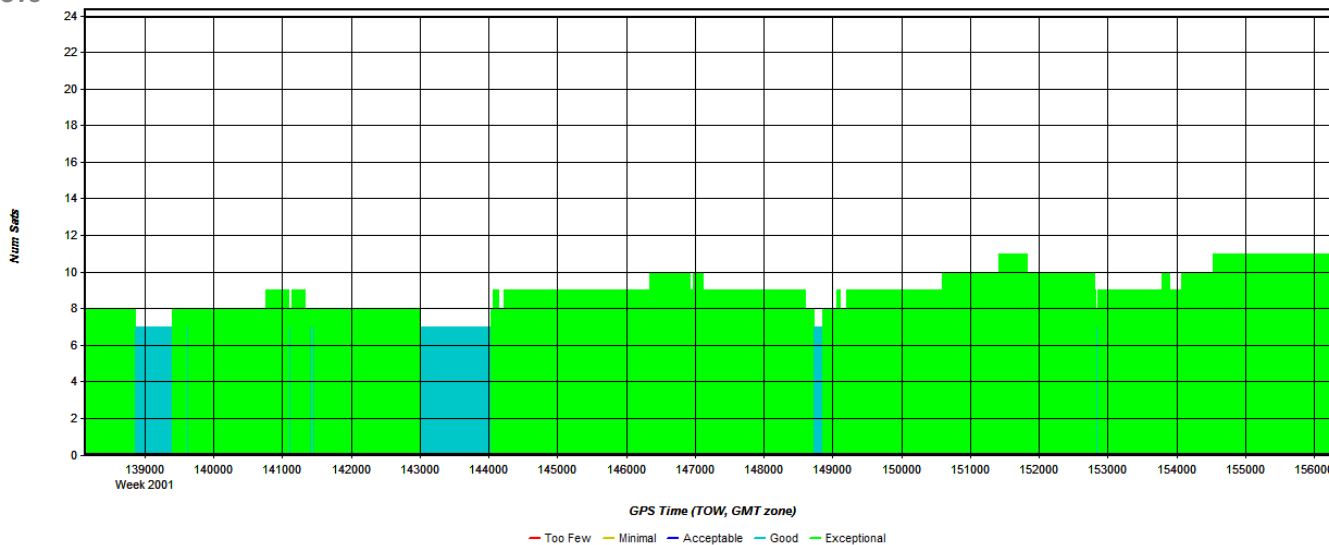




Combined RMS



SVs



USGS
COLLECTION REPORT



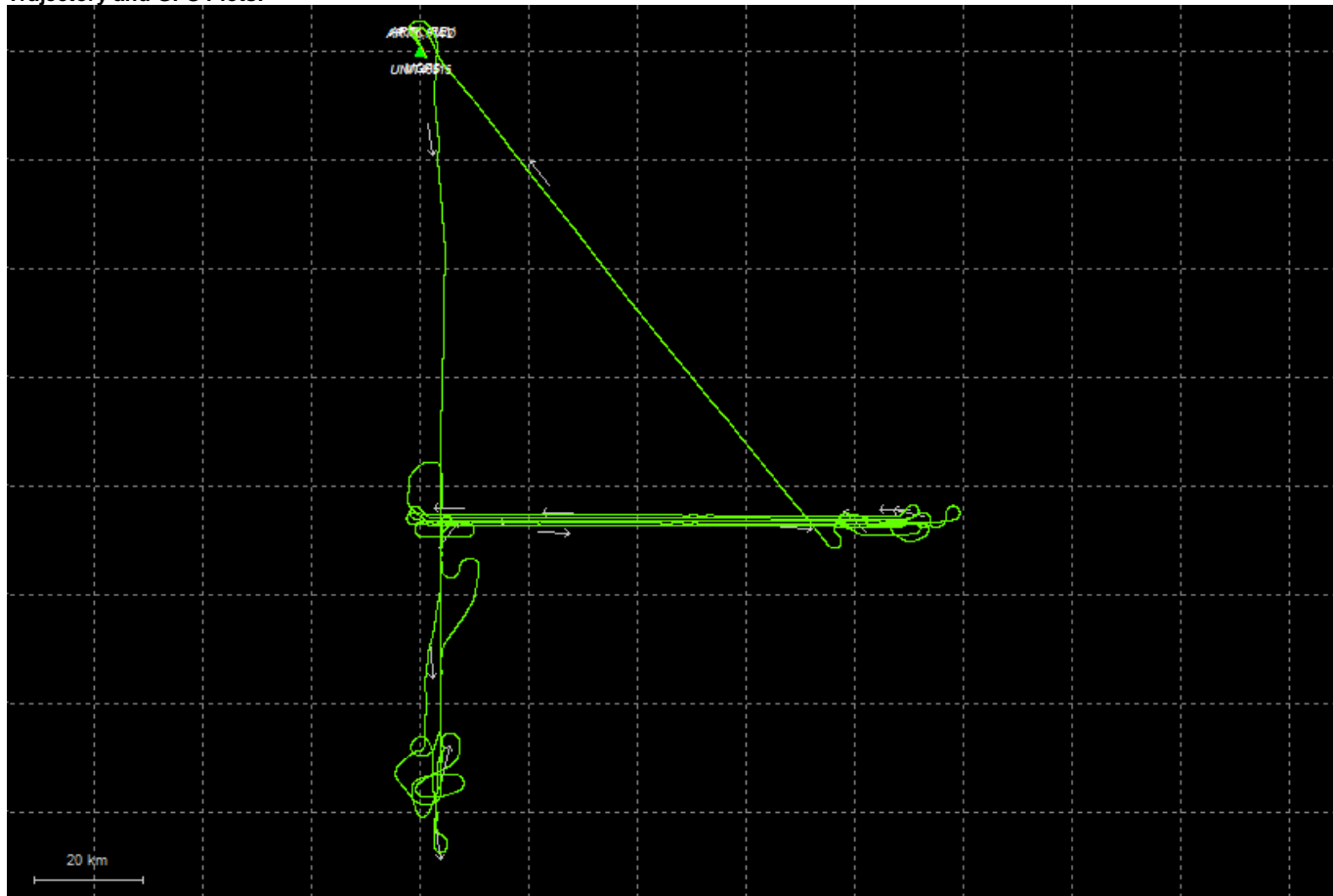
Acquisition and Processing details ----- (May 15, 2018)

Log: 180515_165_33780055_16

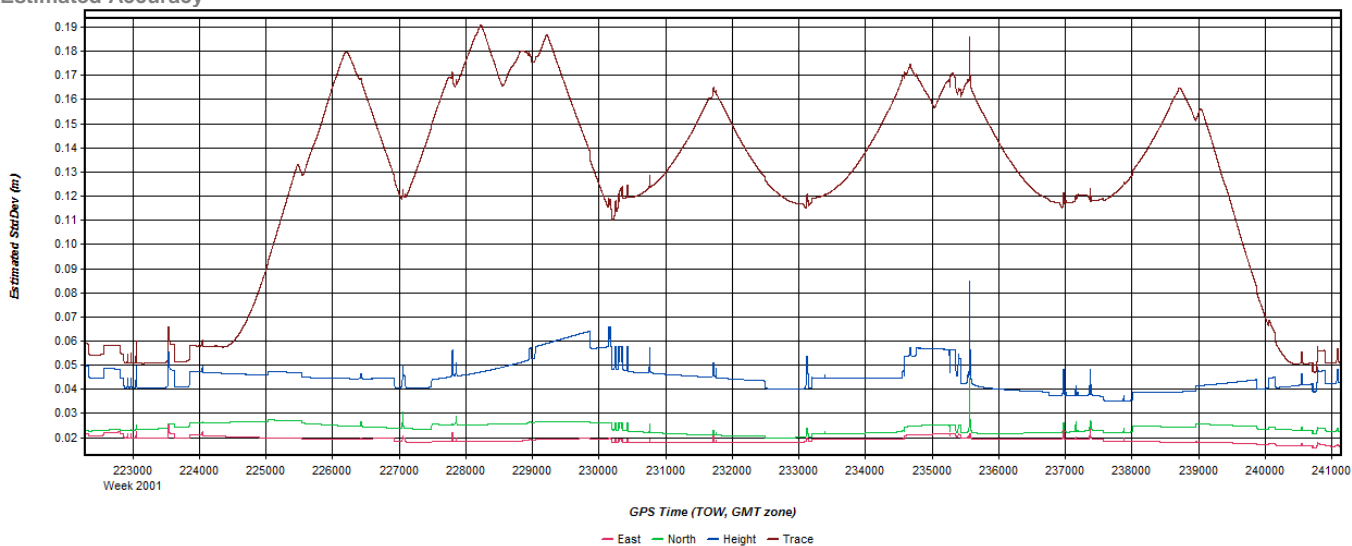
FUGRO		Fugro USA Land, Inc.										Riegl		Flight Log	
18.01		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity			AC80-50-00-02	
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs					
1		KRAP	13:39	1077.8	KRAP	18:59	1082.4	5:19	5.25	4.6	0900-Production				
2															
3															

FGI Job #	Project Name				System	Unit	IMU			Ground Temp °C	Min Range'	Data Logger Drives		
33780055	USGS SD FY18 NRCS Lidar utm13 EAST Riegl				680I	165	FMU-300	-		13.0 22.0	1542			
Flight Date	GPS Day	Lift			Sun°	Solar Times (UTC)	Pulse Rate			Flying Temp °C	Max Range'	Download Drive		
15-May-18	18-135	16			-	-	330			14.0 16.0	2933	10TBBU01; NS1TB67		
Mission ID (yyymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altitude Setting	Humidity @ Alt	Shipping Track	
180515_165_33780055_16	N97HC	KRAP	CCNS 5	-6	2400	130	-	130	2	0.440	30.10 30.05	-	NA	
Pilot #1	Pilot #2		Operator #1		Operator #2									
Jonathan Coleman			Chris Acuña		-									
Base 1 ID	Location		Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator		Data	
FGI 081	KRAP		GR3#4	GR3#4	1.8	15-May-18 12:04		-		-	Chris Acuña		FTP	
Area	Flight #	Wpt	Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End	Dir	(GPS)				
							13:58:41	14:03:41			5 Min GND static alignment at KRAP		9	1.0
							14:37:12	14:40:15			S-Turn in flight alignment		9	1.1
RGL_13EX	2		66	78	28.6	33.9	15:53:00	15:54:00	351	5,438	134	Crossing Line	9	1.3
RGL_13_D	65		1	188	0	82.3	15:59:46	16:20:10	29	5,338	131	Lt turb	9	1.3
	66		188	1	82.3	0	16:23:16	16:43:49	260	5,640	120		10	1.0
	67		1	188	0	82.3	16:46:42	17:06:54	1	5,712	133		10	1.0
RGL_13_E	1		-	-	-	-	-	-	-	-	-		-	-
RGL_13_E	1		188	1	82.3	0	17:27:24	17:47:48	260	5,617	127	Lt turb	10	1.2
	1		1	10	0	4	17:50:46	17:51:32	1	5,544	135	Calibration line	11	1.1
	2		1	188	0	82.3	17:56:46	18:16:40	1	5,391	140		10	1.1
	5		188	178	82.3	77.9	18:19:36	18:20:53	260	5,707	131	Reflight from Lift 15 to fill a data gap	10	1.0
							18:21:51	18:24:03				S-Turn post in flight alignment	10	1.1
							18:53:11	18:58:11				5 Min post GND static alignment at KRAP	10	1.1

Trajectory and GPS Plots:

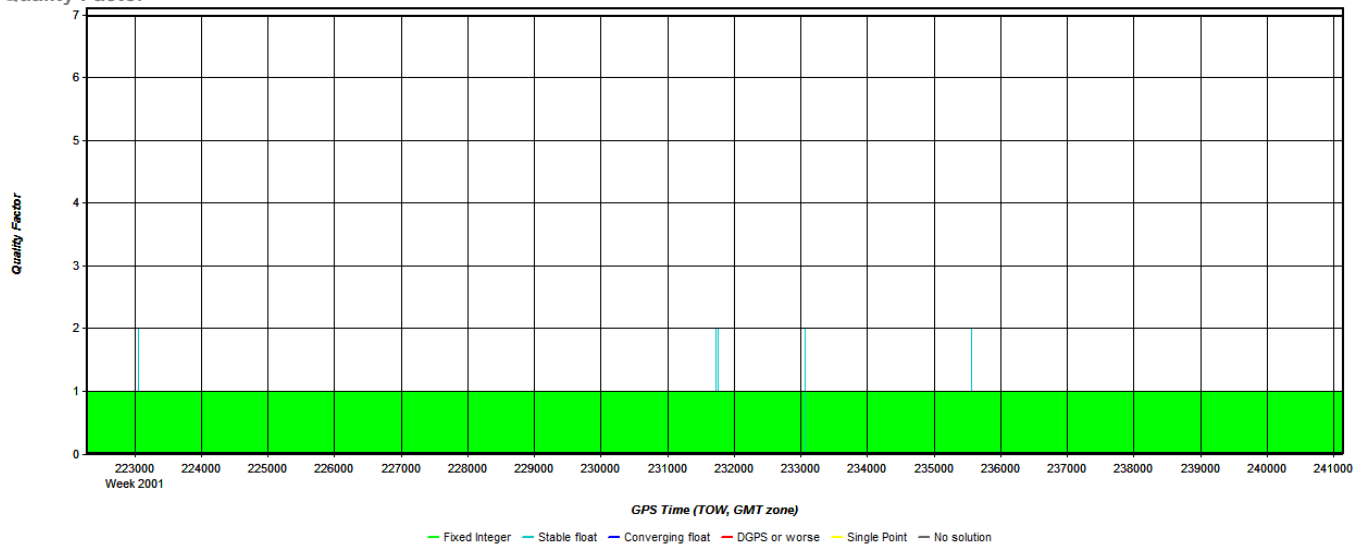


Estimated Accuracy

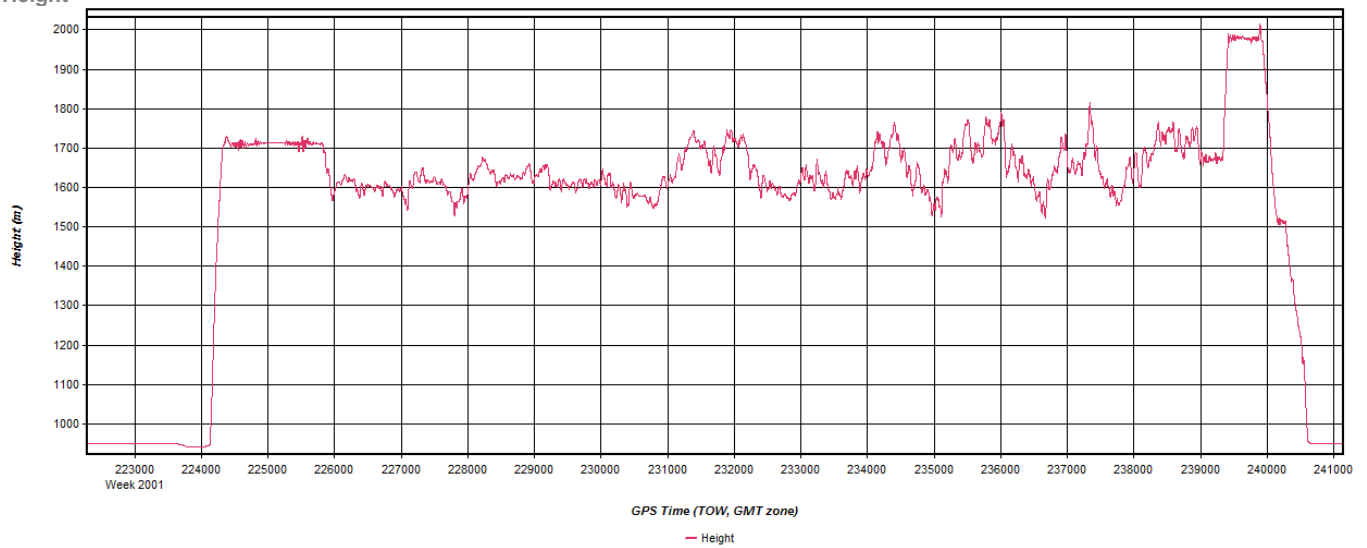


USGS COLLECTION REPORT

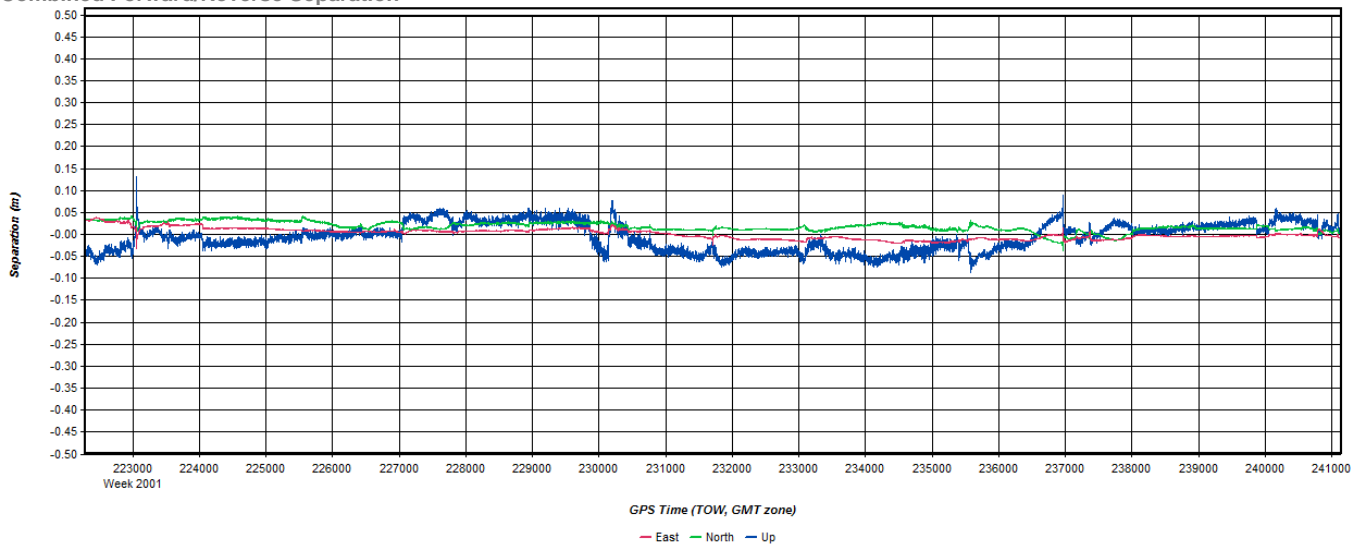
Quality Factor



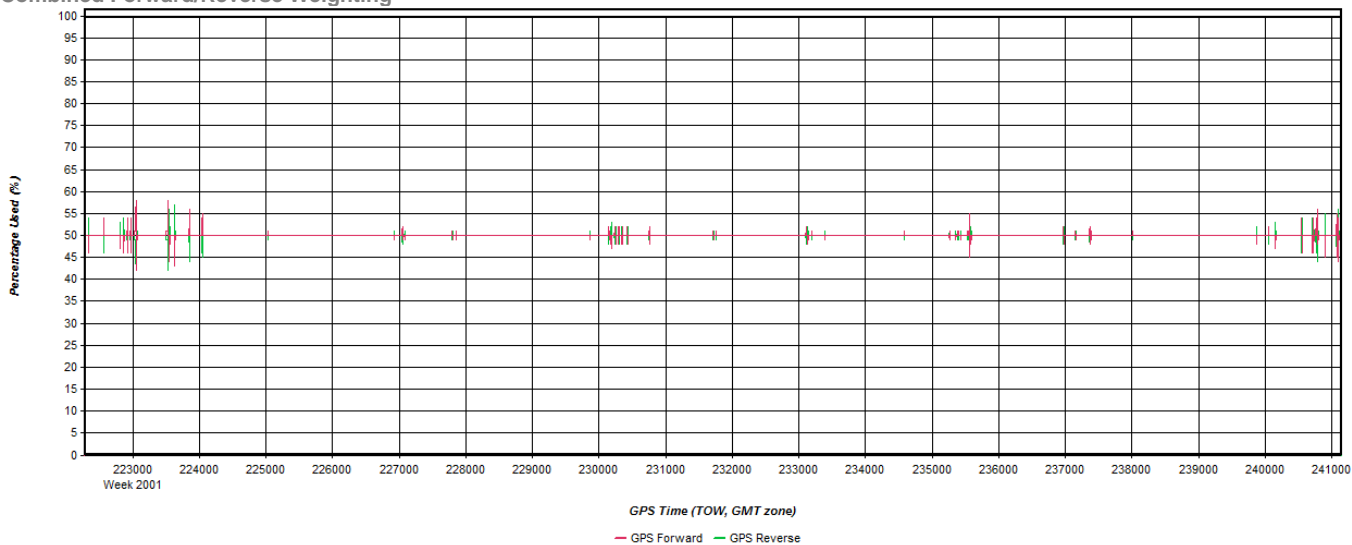
Height



Combined Forward/Reverse Separation

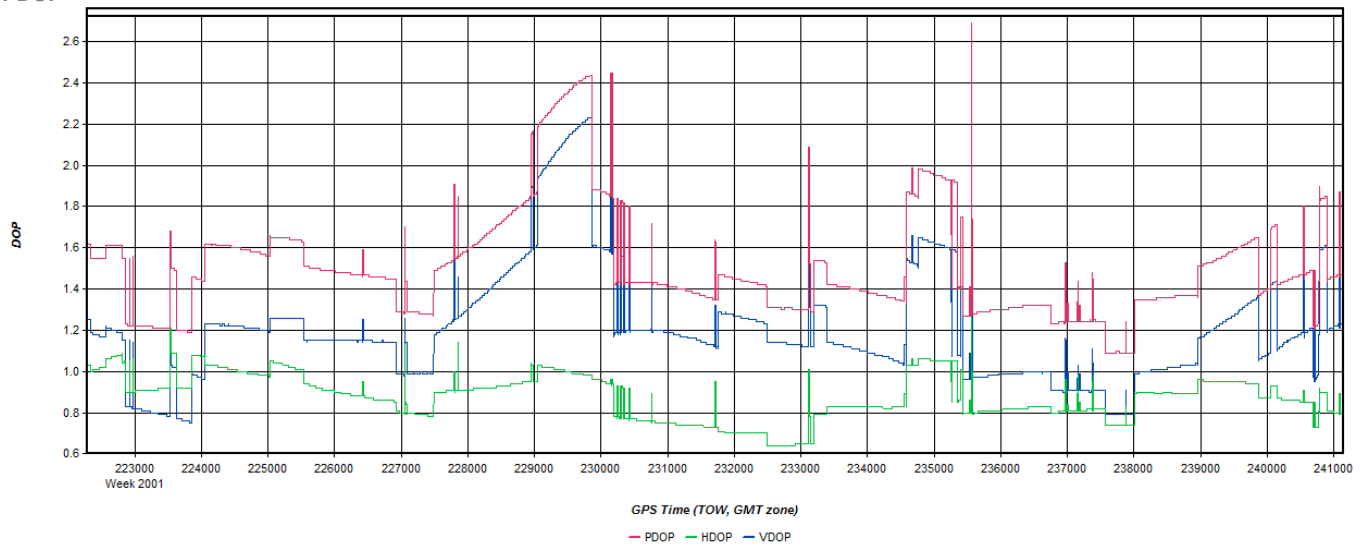


Combined Forward/Reverse Weighting

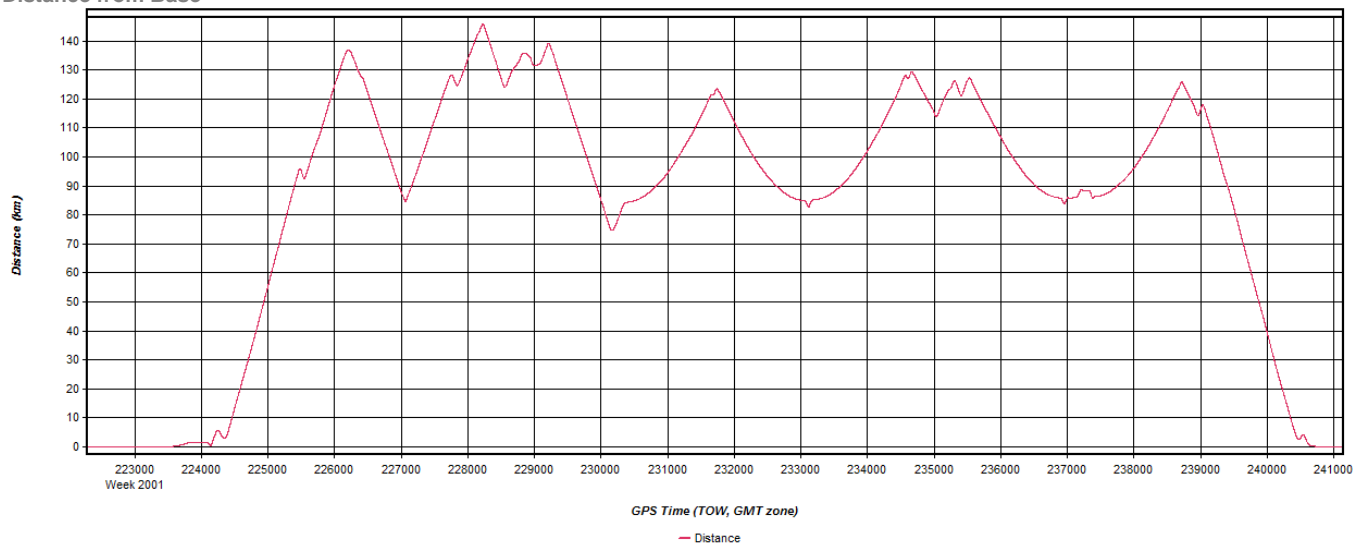


USGS COLLECTION REPORT

PDOP

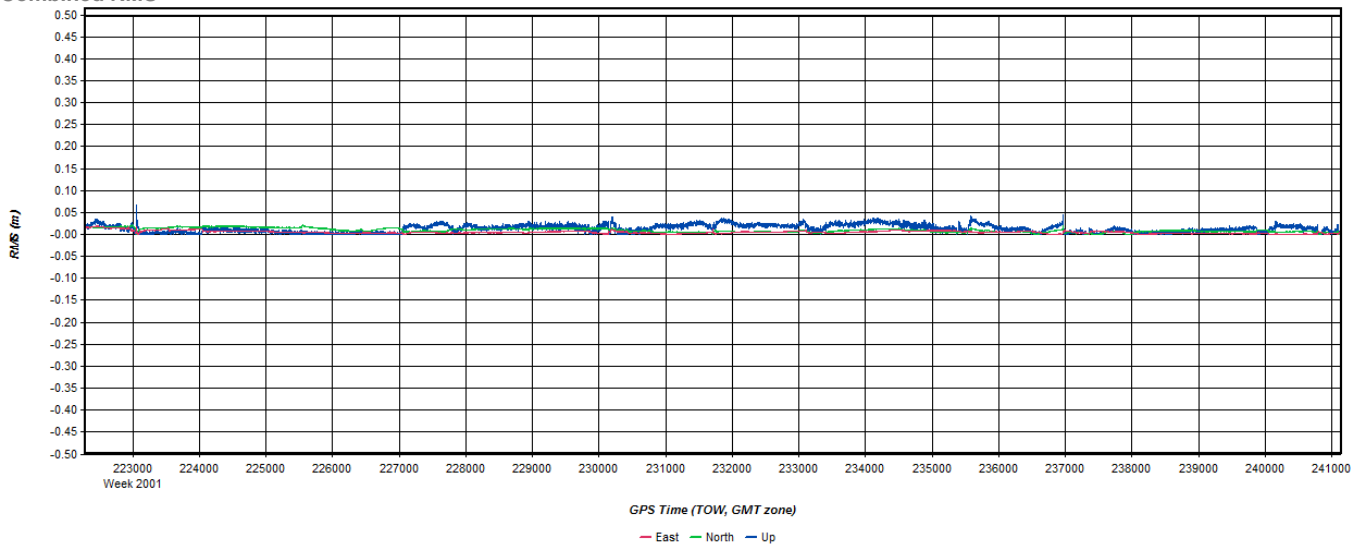


Distance from Base

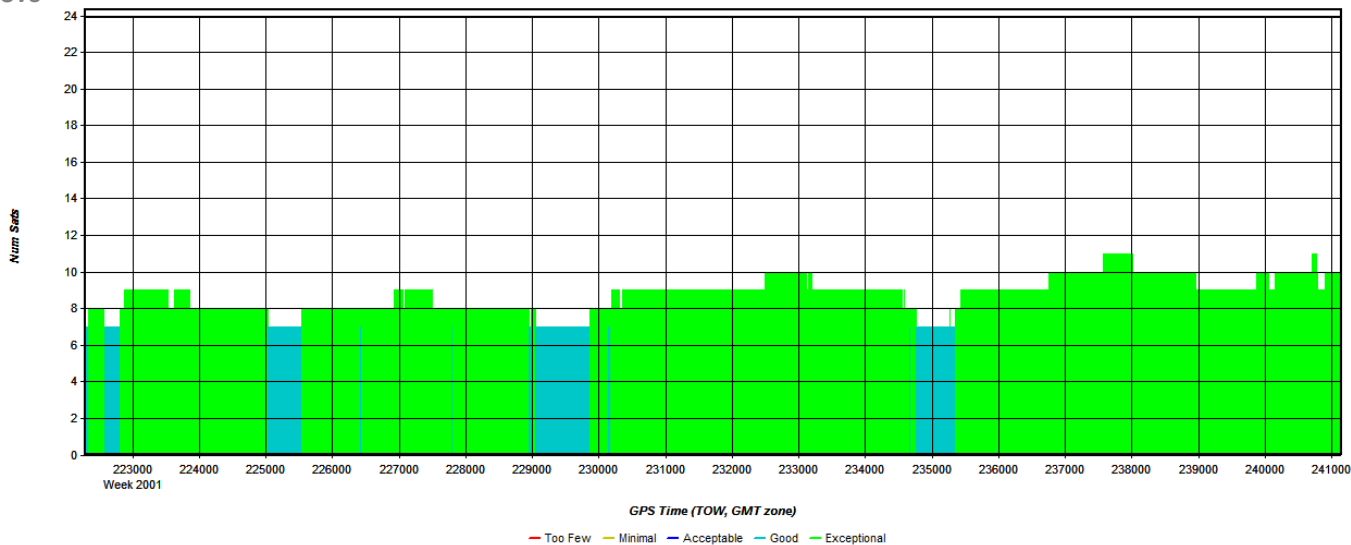




Combined RMS



SVs



Acquisition and Processing details ----- (May 22, 2018)

Log: 180522_130_33780055_01

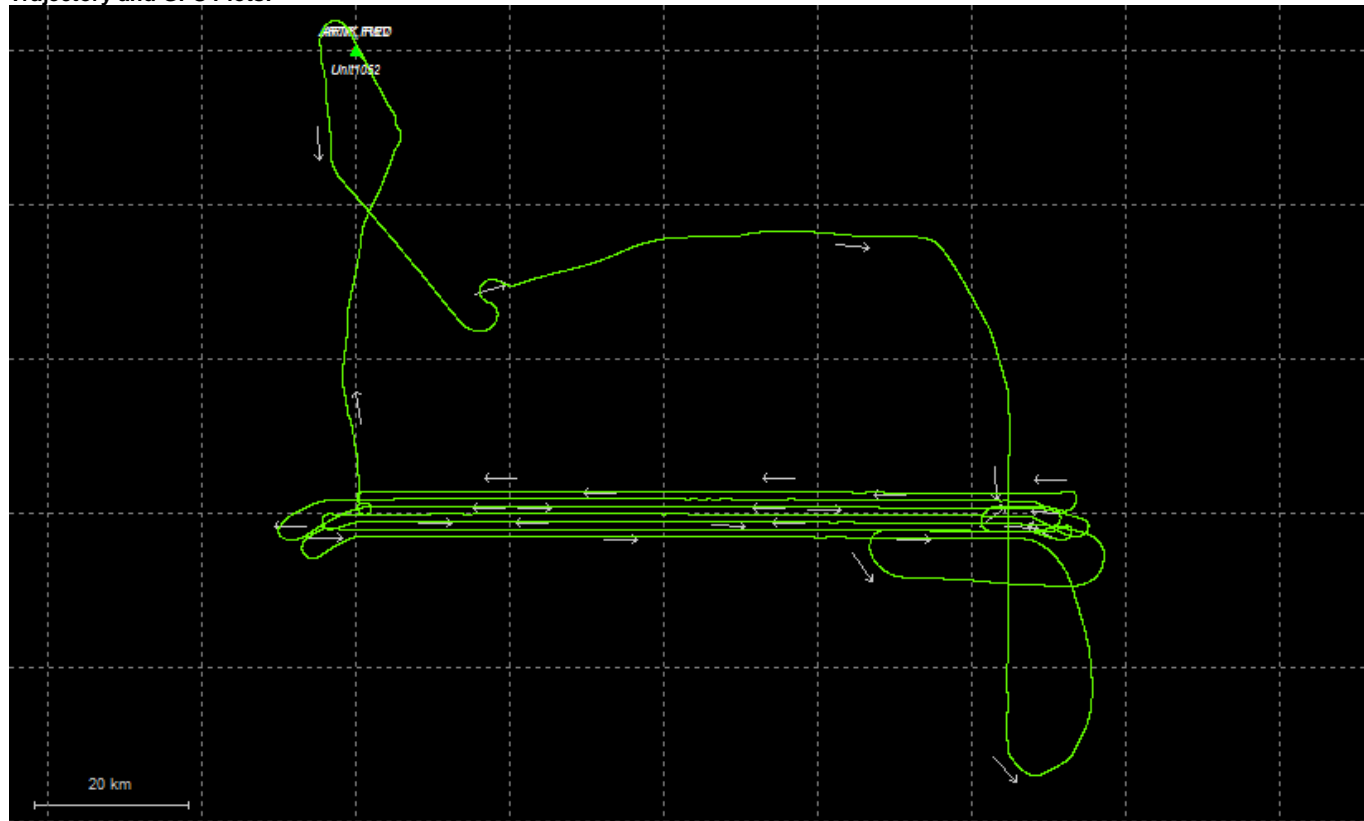
USGS
COLLECTION REPORT



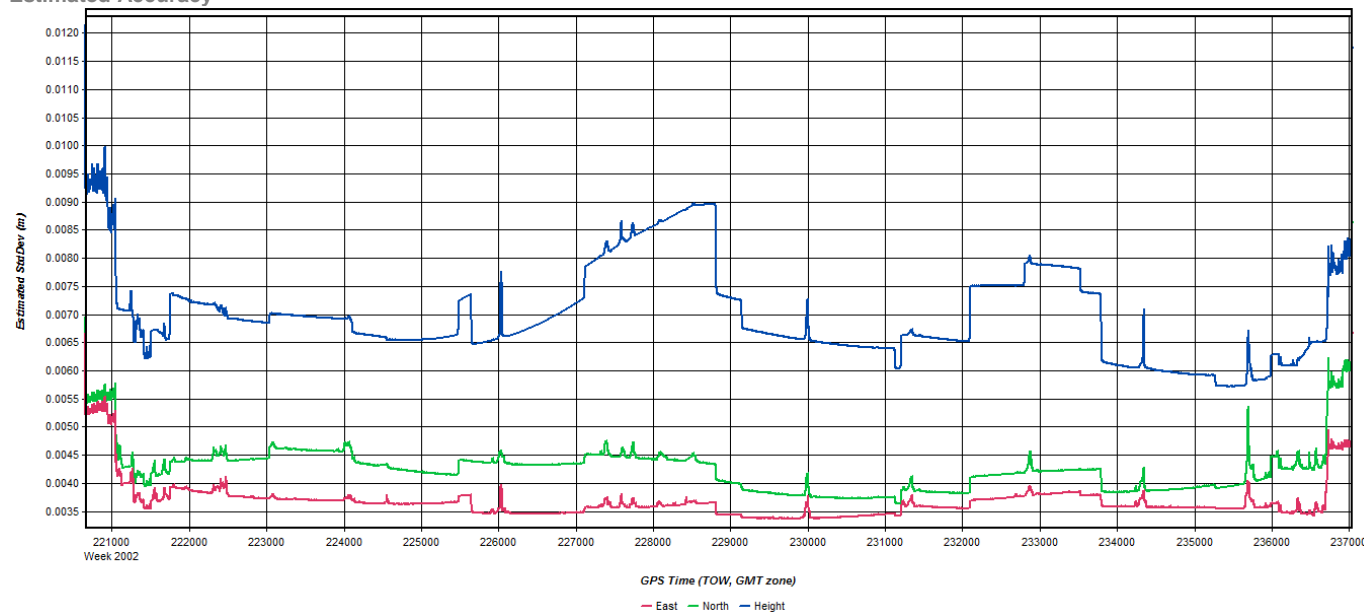
Menu		18.101			Lift Begin			Lift End			Flt	Flt	Hobbs	Activity
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs				
1	KRAP	15:55	1084.0	KRAP	20:55	1089.0	5:00	5.00	5.0	0900-Production				
2														
3														

FUGRO USA Land, Inc.		ALS		Flight Log		AC80-44-00-02							
FGI Job # 17003900	Project Name ALS_West		System ALS80	Unit 130	IMU uIRS	PIA 3	Data Logger Drive						
Flight Date 20-May-18	GPS Day 18-140	Lift 1	Sun°	Solar Times (UTC)		Laser Power 100%	Pattern Triangle						
Mission ID (yyymmdd_Sen_Job_Lift) 180520_130_17003900_01		Aircraft N62912	Airport ID KRAP	FMS	UTC	AMT (ft) 7,650	Speed <150						
Pilot #1 Jeffrey Clarke		Pilot #2	Operator #1 Lee Scadden		Operator #2			Erased this flight log before I saved it. Trying to remember best I c					
Base 1 ID FGI 081	Location KRAP		Rec ID GRD1-	Ant ID GRD1-	ARP (m) 1.8	Start Time (UTC) 180520-12:15	Stop Time (UTC) 180520-02:05						
GPS Filename Unit10520m000		Operator Chris Fought		Data FTP									
Area	Flight #	Wpt	Distance	UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOF
	FGI	Client's	From	To	Begin	End	Dir	(GPS)	(knots)	Rate			
					16:00:00	16:05:00					5-Minute GRD Static	15	1.3
											S-Turn	16	1.2
X Line	2	1	26	0	35		N	145			cross line	18	1.2
ALS West	1	51	1	70	0		W	144				18	1.2
	2	1	51	0	70		E	146				19	1.1
	3	51	1	70	0		W	145				18	1.3
											S-turn		
	4	51	1	70	0		W	146				18	1.2
	3	1	5	0	5.6		E	142			picked up wpts 1-5	19	1.1
	5	1	51	0	70		E	144					
	6	51	1	70	0		W	147					
	7	1	51	0	70		E	144			cloud on west end km 1-5		
	8	51	1	70	0		W	145			cloud km 5-1	19	1.3
	9	1	51	0	70		E	143			cloud km 1-5	20	1.1
											S-turn		
											5-Minute GRD Static		

Trajectory and GPS Plots:

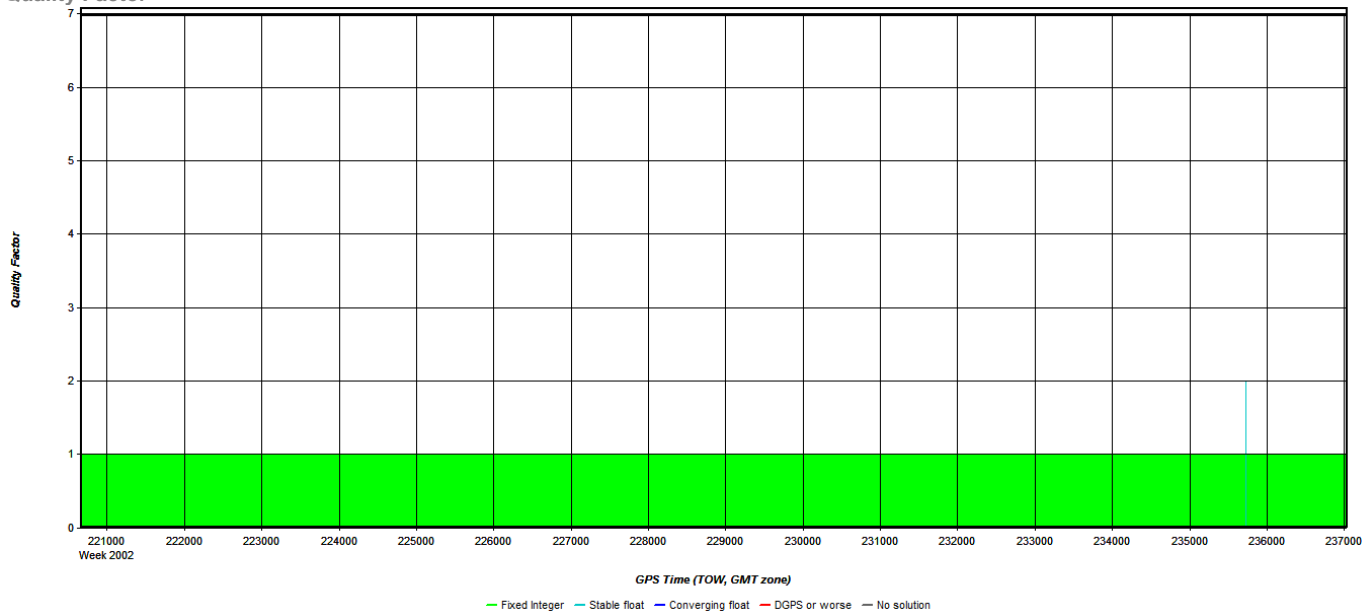


Estimated Accuracy

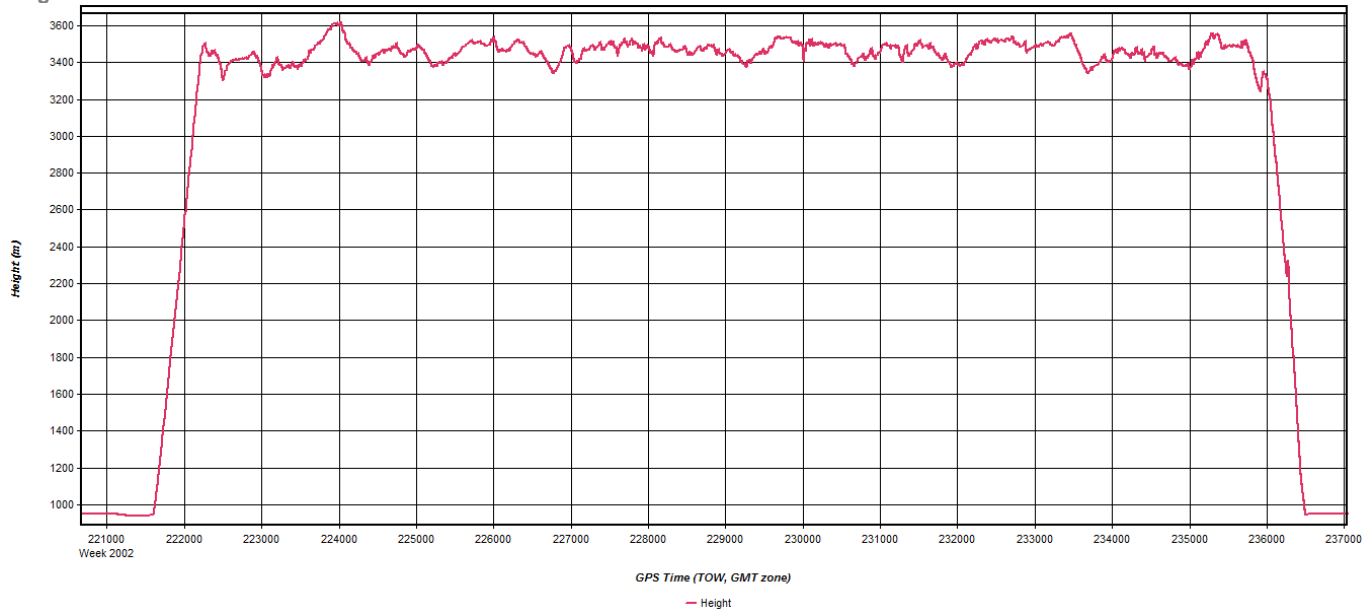




Quality Factor

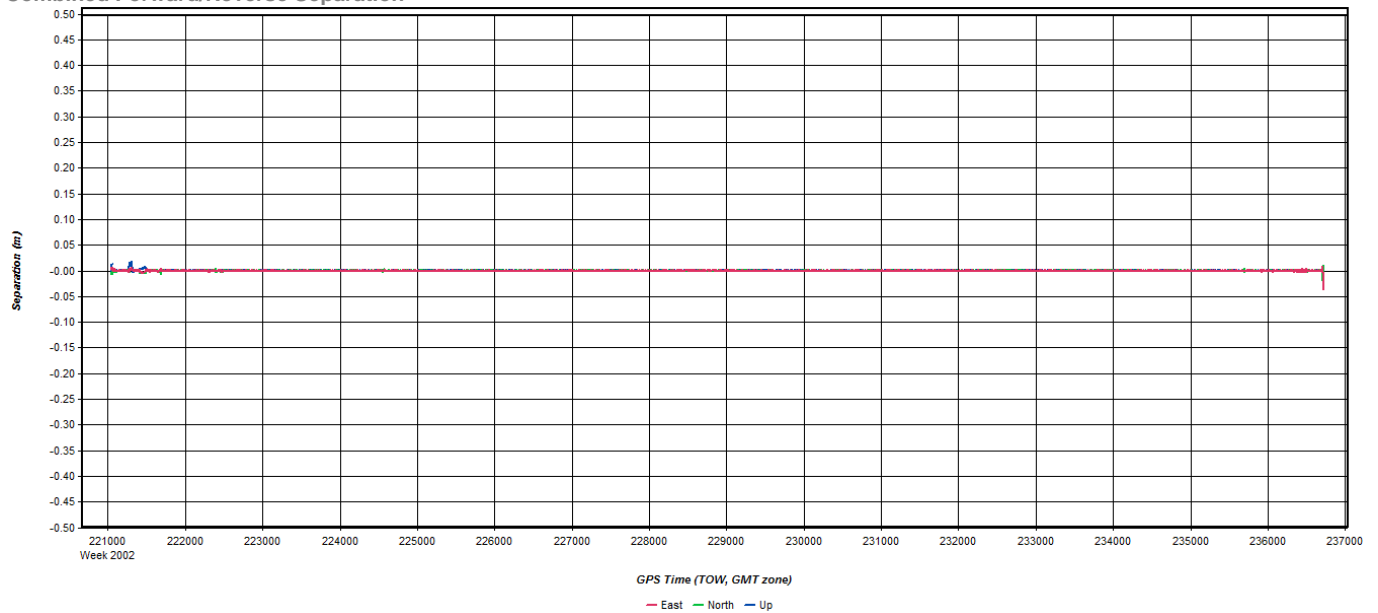


Height

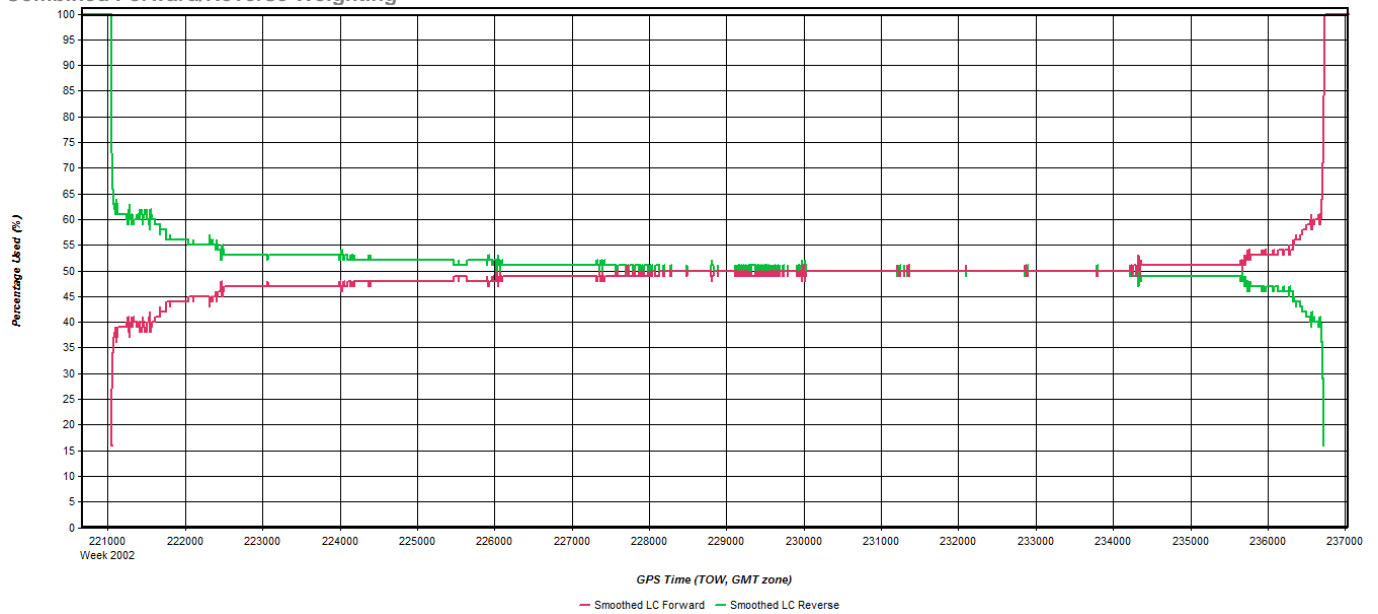


USGS COLLECTION REPORT

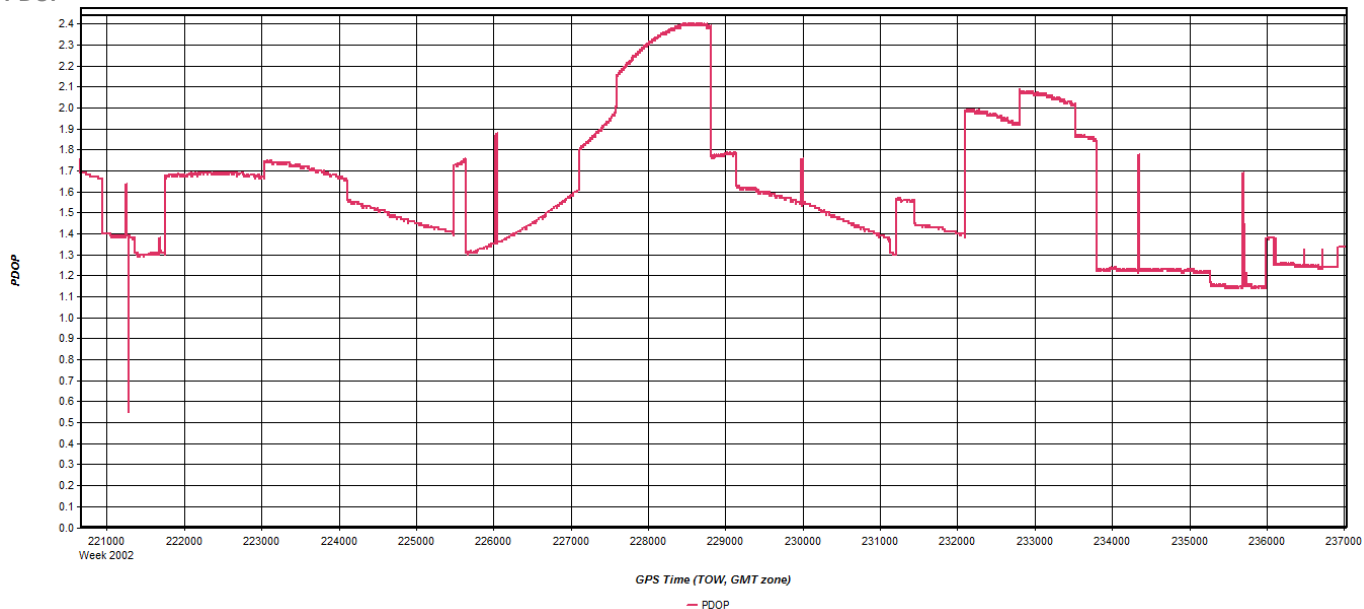
Combined Forward/Reverse Separation



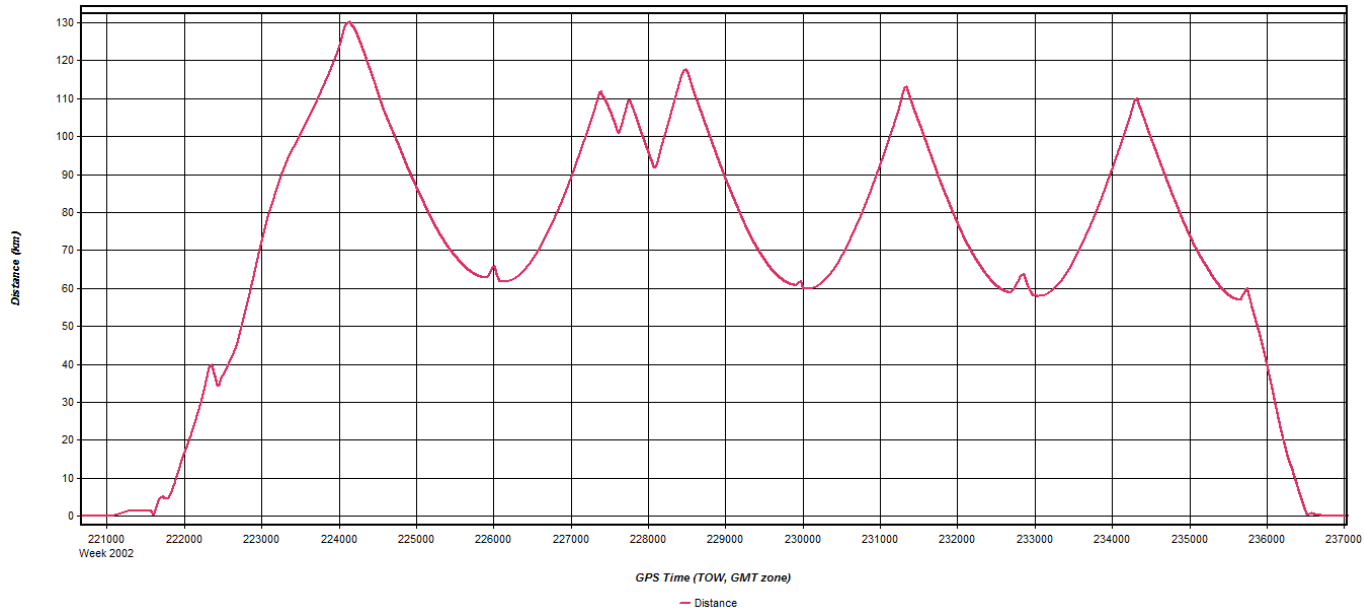
Combined Forward/Reverse Weighting



PDOP

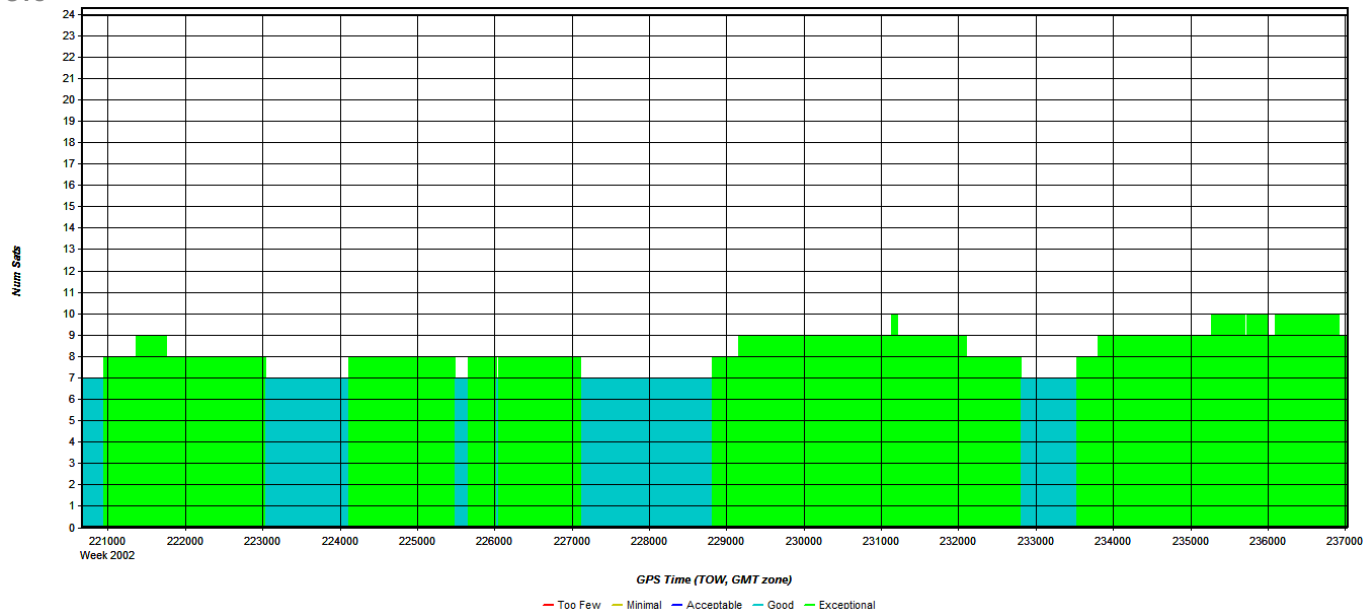


Distance from Base





SVs



**USGS
COLLECTION REPORT**



Acquisition and Processing details ----- (May 22, 2018)

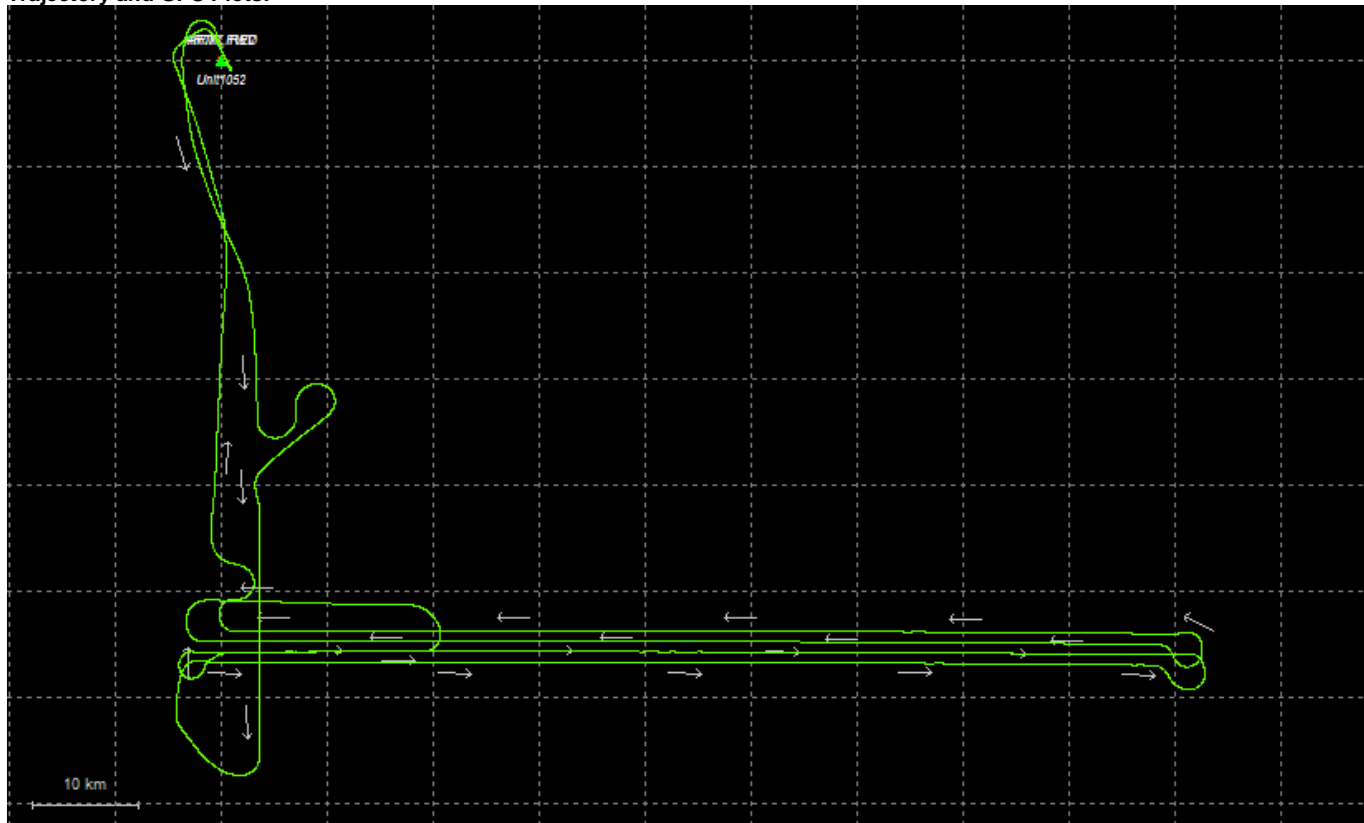
Log: 180522_130_33780055_02

Menu		18.101										ALS	
		Lift Begin			Lift End			Flt	Flt	Hobbs	Activity		
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs			
		1	KRAP	18:28	1102.7	KRAP	21:08	1105.4	2:40	2:75	2:7	0900-Production	
		2											
		3											

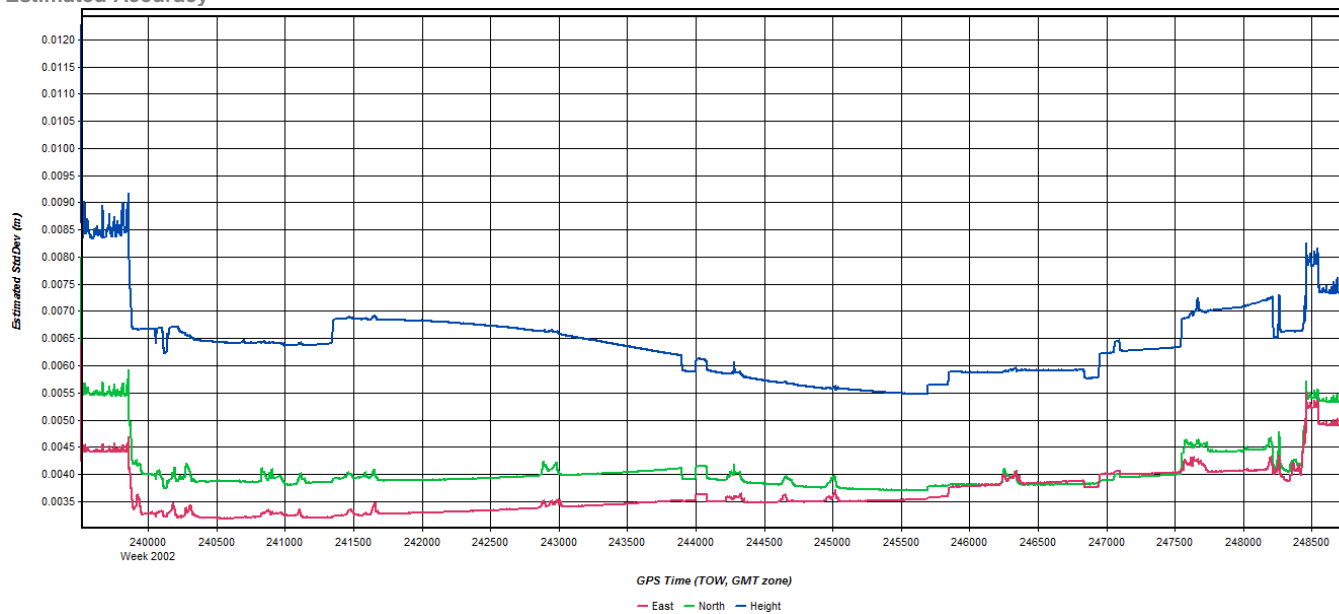
Fugro USA Land, Inc. Flight Log AC80-44-00-02

FGI Job # 33780055	Project Name JSGS SD FY18 utm13 EAST ALS80			System ALS80	Unit 130	IMU uRS	PIA	SW1	SW2-Gain	Aper	AutoScan YES	Ground Temp °C 24.0 26.0	Min Range Gate 8020	Data Logger Drive		
Flight Date 22-May-18	GPS Day 18-142	Lift 2		Sun° N/A	Solar Times (UTC) N/A		Laser Power 100%	Pattern Triangle	Flying Temp °C 2.0 5.0	Max Range Gate 9147	Download Drive					
Mission ID (yymmdd_Sen_Job_Lift) 180522_130_33780055_02			Aircraft N62912	Airport ID KRAP	FMS FCMS	UTC -6	AMT (ft) 8,700	Speed <150	Scan Hz 55.0	Pulse Rate 534k	FOV 21	kmWPT 1.595	Altm Setting 29.95 29.93	Shipping Track		
Pilot #1 Jeffrey Clarke		Pilot #2		Operator #1 Eric Mueller		Operator #2										
Base 1 ID FGI 081	Location KRAP		Rec ID GRD1-	Ant ID GRD1-	ARP (m) 1.8	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator Chris Fought		Data		
Area	Flight #		Wpt		Distance		UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate				
							18:31:50	18:36:50					GROUND-STATIC @ KRAP		17	1.3
							18:53:00	18:55:00			153		PRE ACQUISITION CALIBRATION		19	1.2
ALS13X	7		22	15	33.5	22.3	19:00:00	19:03:00	172.5	11590	145		CROSS LINE		19	1.2
ALS13D	4		1	53	0	82.9	19:08:00	19:27:00	082.4	11490	148		CHECK FOR CLOUDS AT EAST END		21	1.2
	3		53	1	82.9	0	19:30:00	19:49:00	263.8	11490	148		CHECK FOR CLOUDS AT EAST END		18	1.4
	3		1	10	0	14.4	19:53:00	19:57:00	082.4	11490	144		CALIBRATION LINE		23	1.1
	2		1	53	0	82.9	20:04:00	20:23:00	082.5	11490	143		CHECK FOR CLOUDS AT EAST END		24	1.0
	1		53	1	82.9	0	20:26:00	20:45:00	263.8	11490	144		CHECK FOR CLOUDS AT EAST END		22	1.0
							20:45:45	20:48:00		11510	151		POST ACQUISITION CALIBRATION		21	1.1
							21:00:40	21:05:40					GROUND-STATIC @ KRAP		20	1.1

Trajectory and GPS Plots:

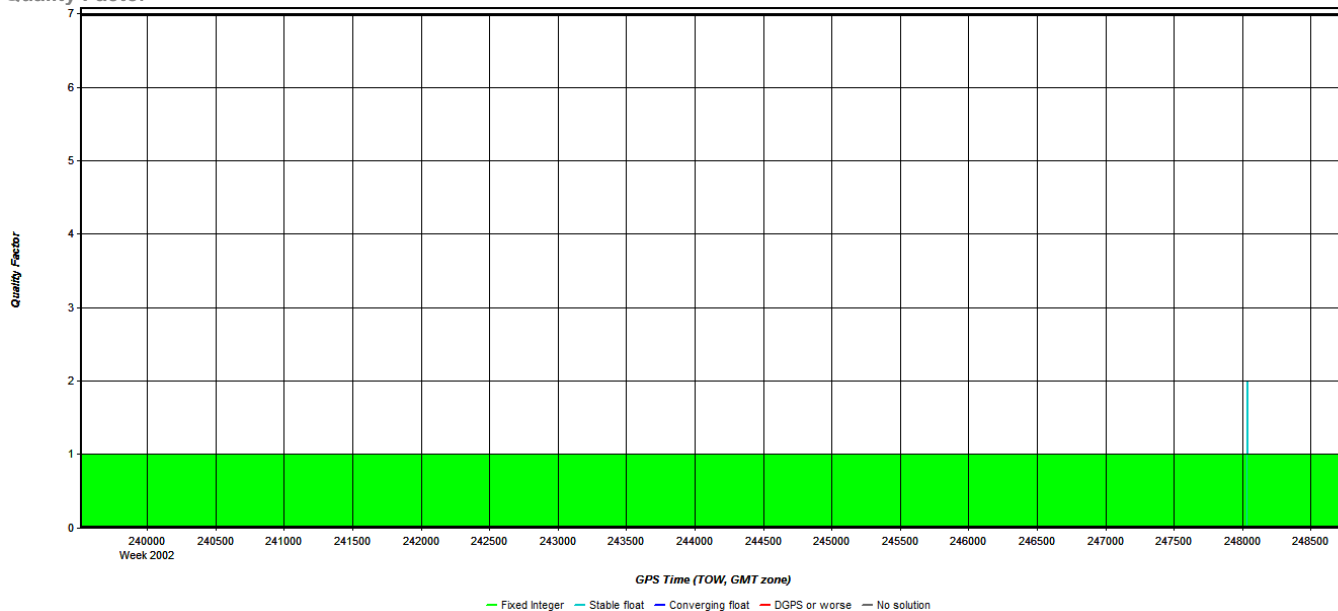


Estimated Accuracy

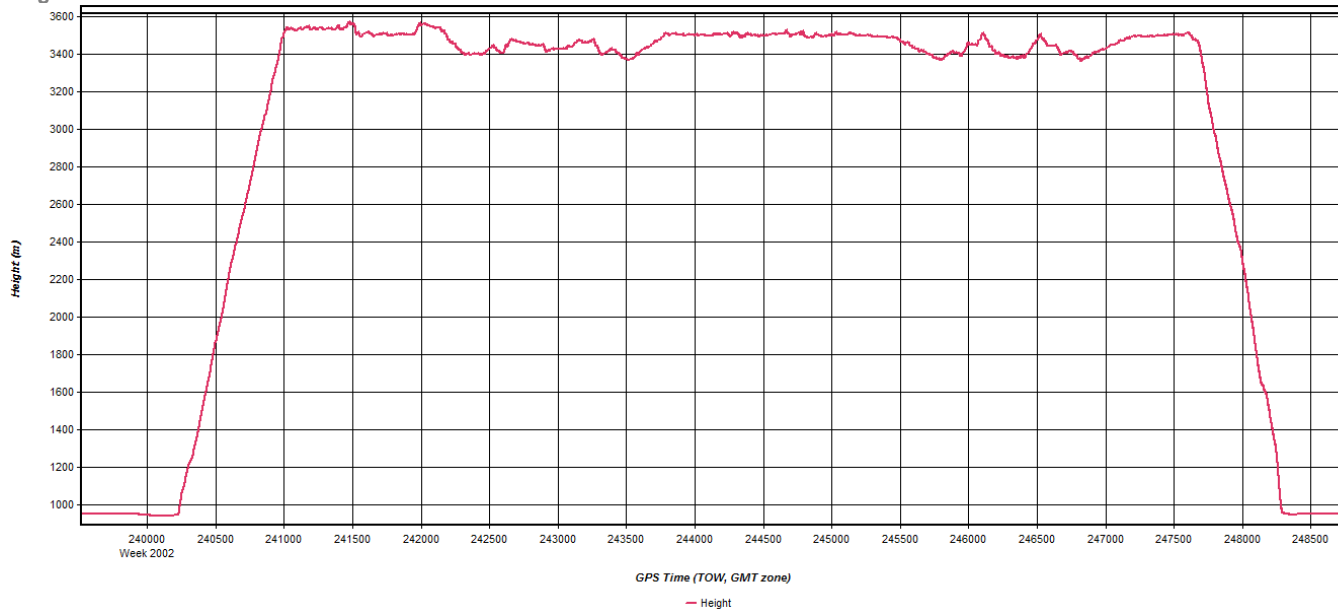




Quality Factor

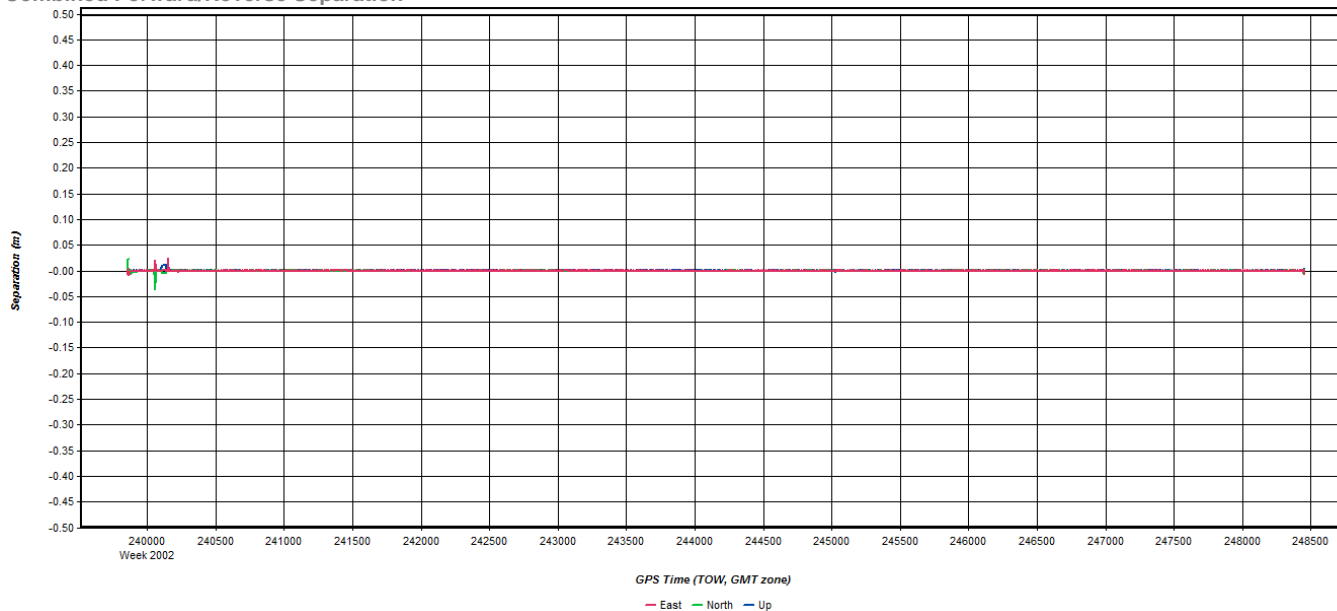


Height

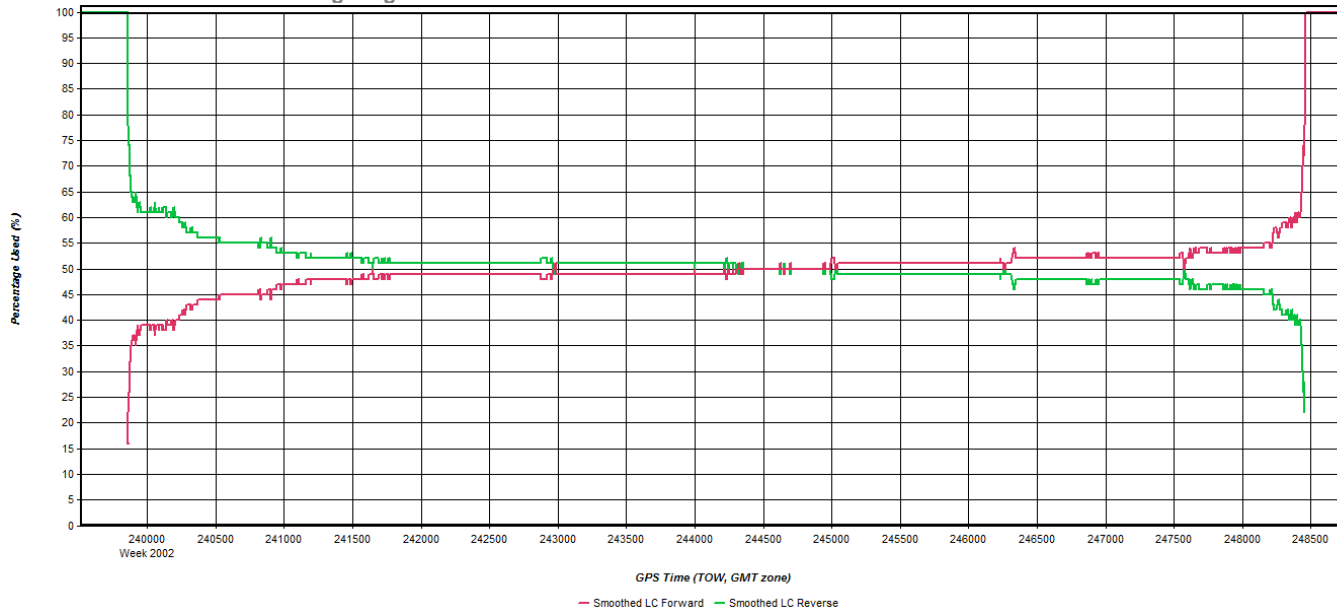




Combined Forward/Reverse Separation

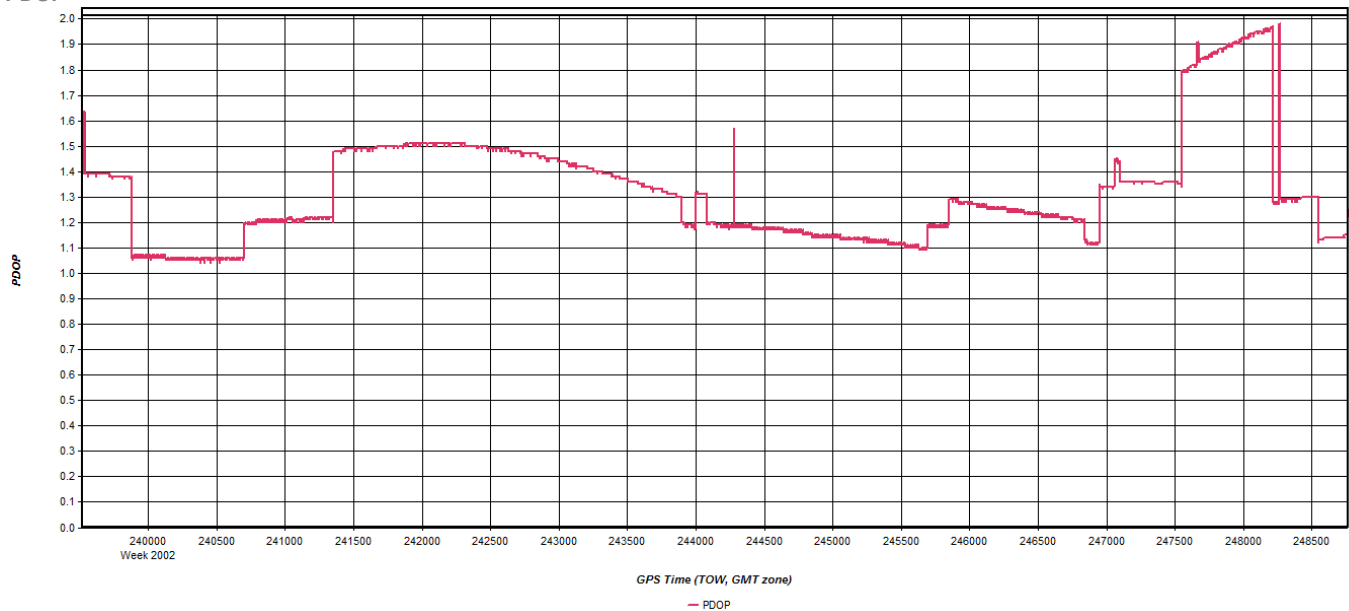


Combined Forward/Reverse Weighting

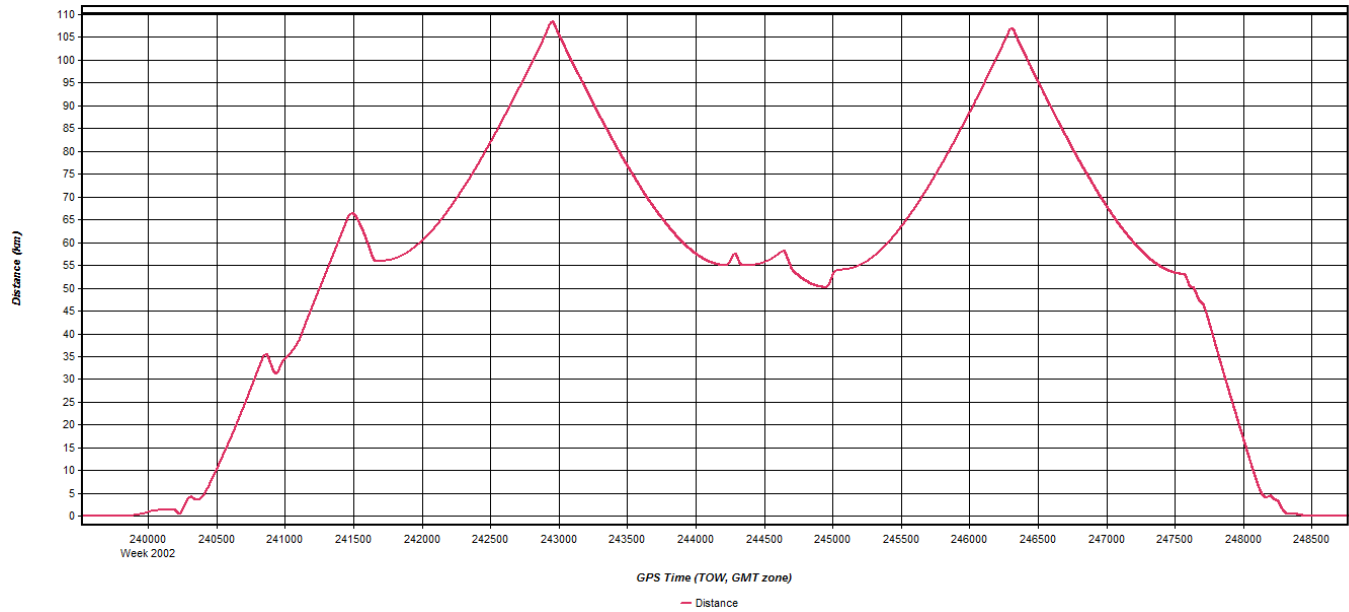


USGS COLLECTION REPORT

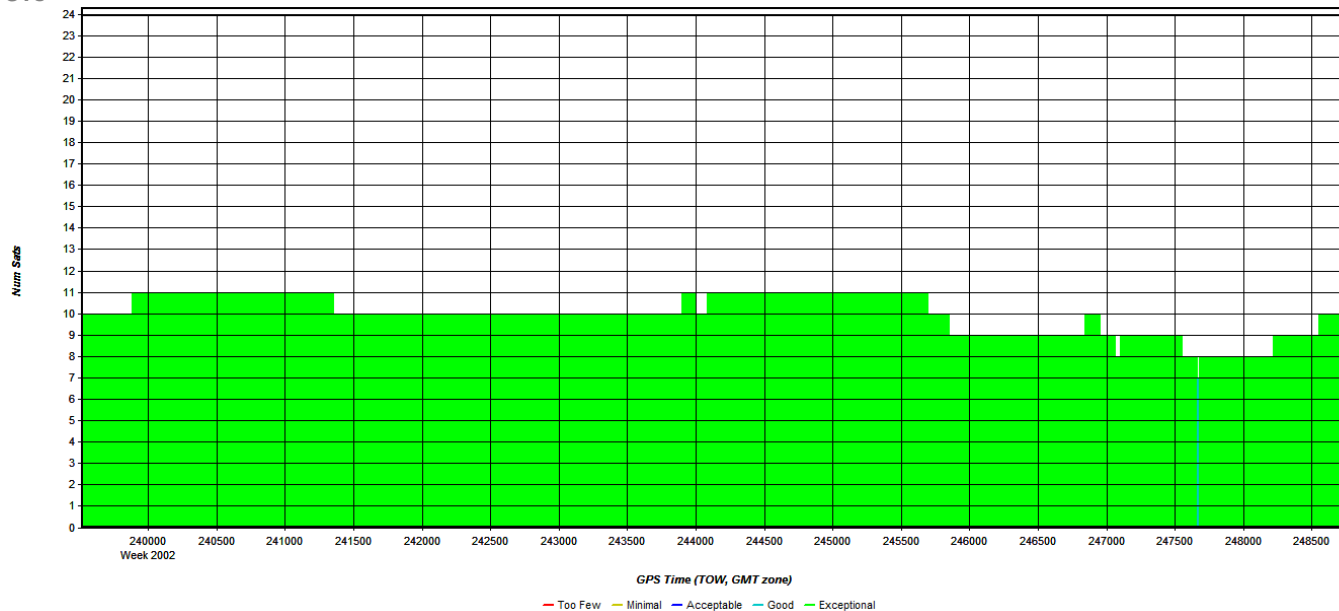
PDOP



Distance from Base



SVs



Acquisition and Processing details ----- (May 24, 2018)

Log: 180524_130_33780055_03

USGS
COLLECTION REPORT



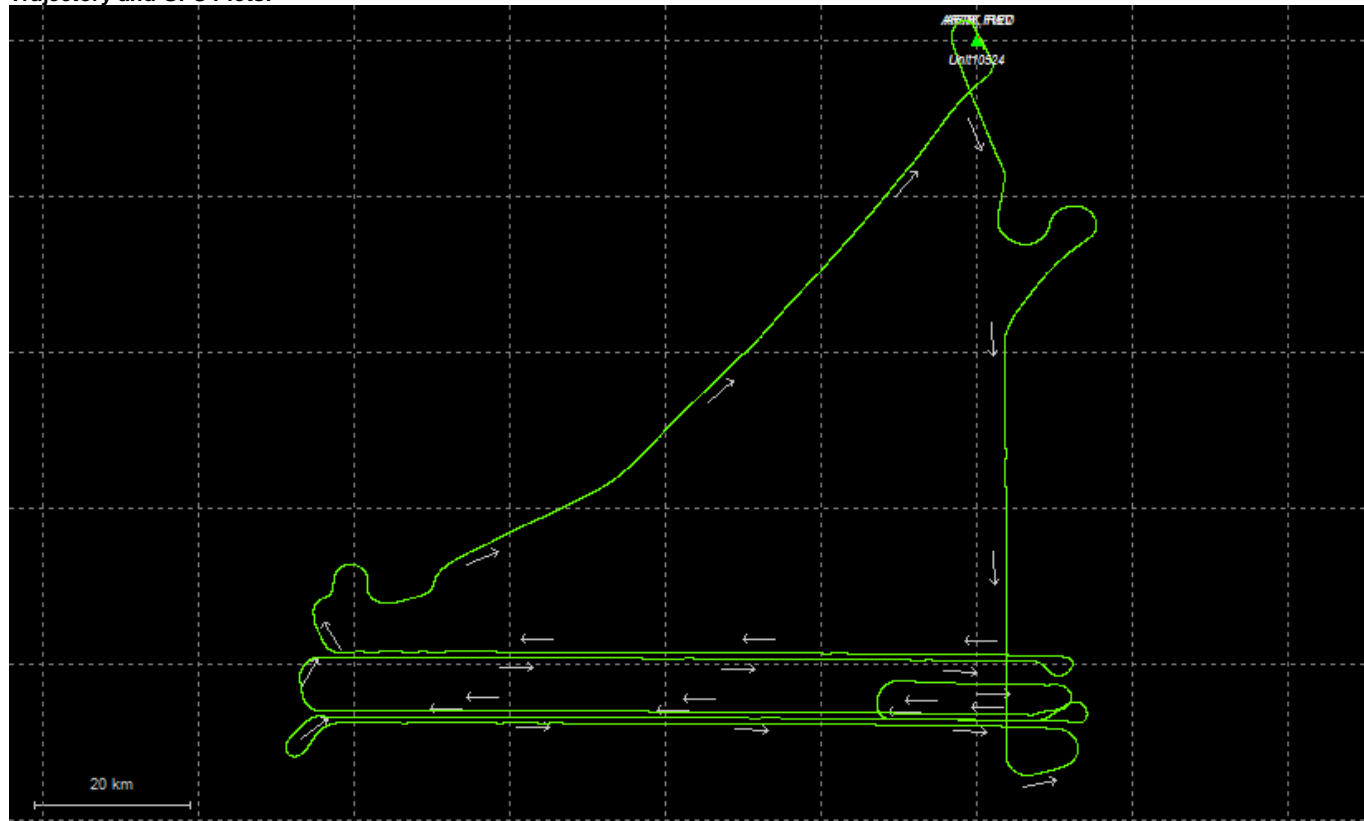
Menu

18.101	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	16:51	1110.3	KRAP	20:22	1113.8	3:30	3.50	3.5	0900-Production
2										
3										

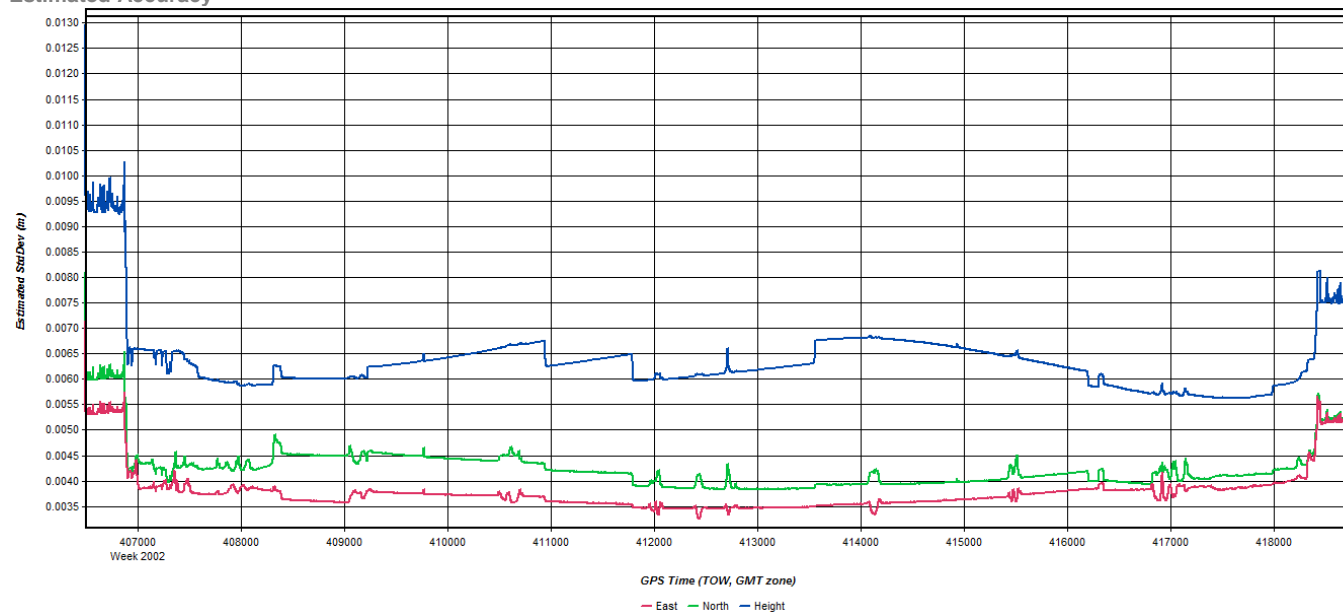
ALS
Flight Log
AC80-44-00-02

FGI Job # 33780055	Project Name SGS SD FY18 utm13 WEST ALS8			System ALS80	Unit 130	IMU uRS	RA 4	SW1	SW2-Gain	Aper	AutoScan YES	Ground Temp °C 25.0 26.0	Min Range Gate 7319	Data Logger Drive	
Flight Date 24-May-18	GPS Day 18-144	Lift 3		Sun° N/A	Solar Times (UTC) N/A	Laser Power 100%	Pattern Triangle	Flying Temp °C 3.0 3.0	Max Range Gate 8825	Download Drive					
Mission ID (yyymmdd_Sen_Job_Lift) 180524_130_33780055_03	Aircraft N62912	Airport ID KRAP	FMS FCMS	UTC -6	AMT (ft) 8,450	Speed <150	Scan Hz 58.0	Pulse Rate 443k	FOV 23	km/WPT 1,549	AltM Setting 29.92 29.93	Shipping Track			
Pilot #1 George Jordan	Pilot #2	Operator #1 Eric Mueller		Operator #2											
Base 1 ID FGI 081	Location KRAP	Rec ID GRD1-	Ant ID GRD1-	ARP (m) 1.8	Start Time (UTC)	Stop Time (UTC)	GPS Filename	Operator Chris Fought	Data						
Area	Flight #		Wpt		Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End							
							16:55:15	17:00:15					GROUND-STATIC @ KRAP	20	1.4
							17:18:17	17:21:43		155			PRE ACQUISITION CALIBRATION	24	1.1
ALS13GX	2		31	1	46.5	0	17:26:54	17:37:22	172.5	11100	137	53.0	CROSS LINE	24	1.1
ALS13G	62		57	1	86.7	0	17:42:08	18:02:02	263.3	12050	150	53.0		23	1.3
	61		1	57	0	86.7	18:06:27	18:26:08	263.3	12150	150	53.0		24	1.0
	61		57	48	86.7	72.8	18:29:56	18:33:38	263.4	12150	147	53.0	CALIBRATION LINE	23	1.1
	60		57	1	86.7	0	18:40:54	19:01:01	263.2	12150	144	53.0	CLOUDS @ WPTS 1-5	21	1.3
	50		1	57	0	86.7	19:04:35	19:24:13	263.3	12050	142	53.0		21	1.2
	49		57	1	86.7	0	19:27:31	19:47:25	263.3	12050	144	53.0	CHECK CLOUDS @ WEST END	20	1.1
							19:50:11	19:52:24		11698	187		POST ACQUISITION CALIBRATION	21	1.0
							20:14:00	20:19:00					GROUND-STATIC @ KRAP	18	1.2

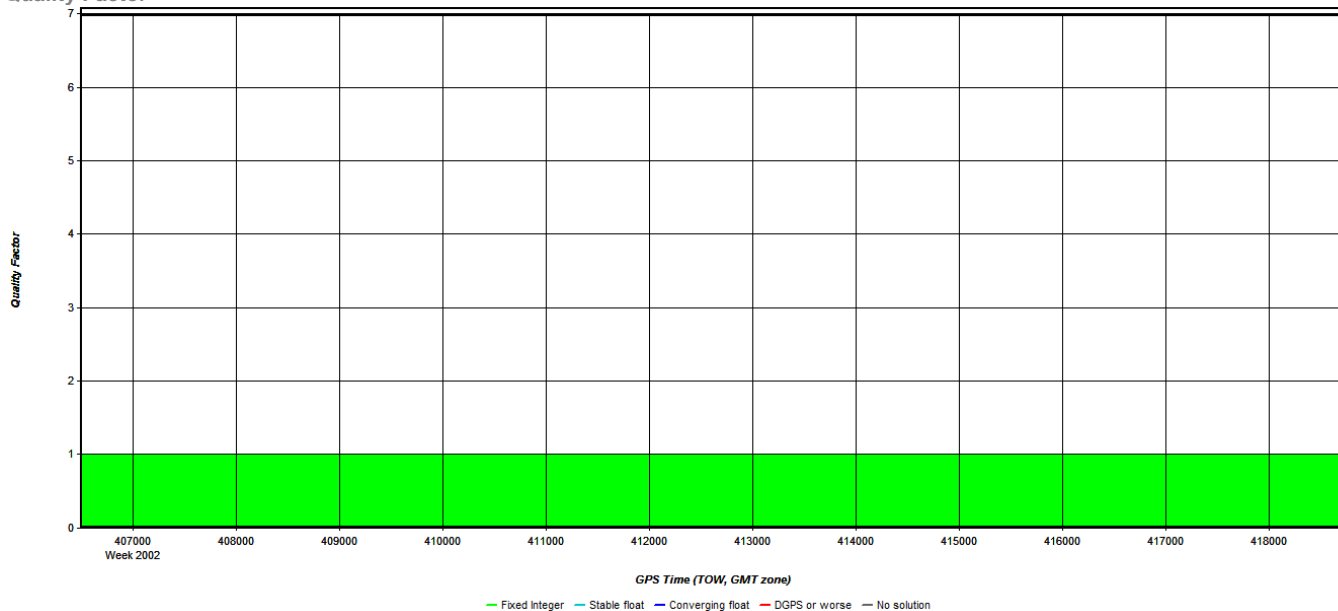
Trajectory and GPS Plots:



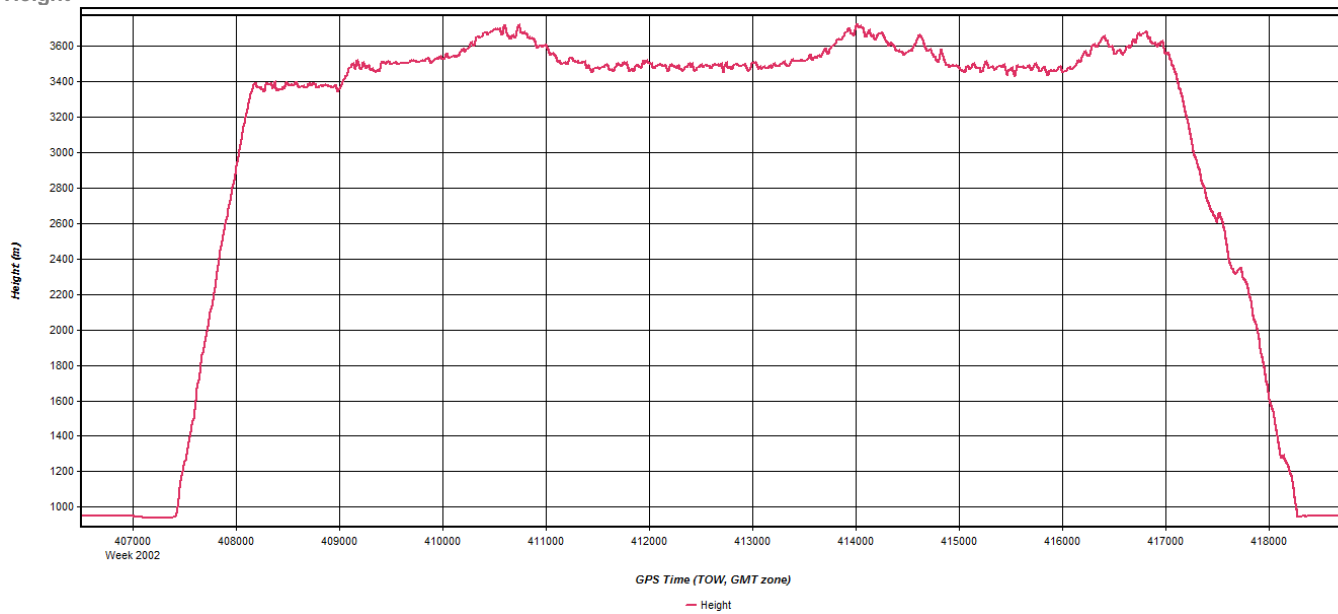
Estimated Accuracy



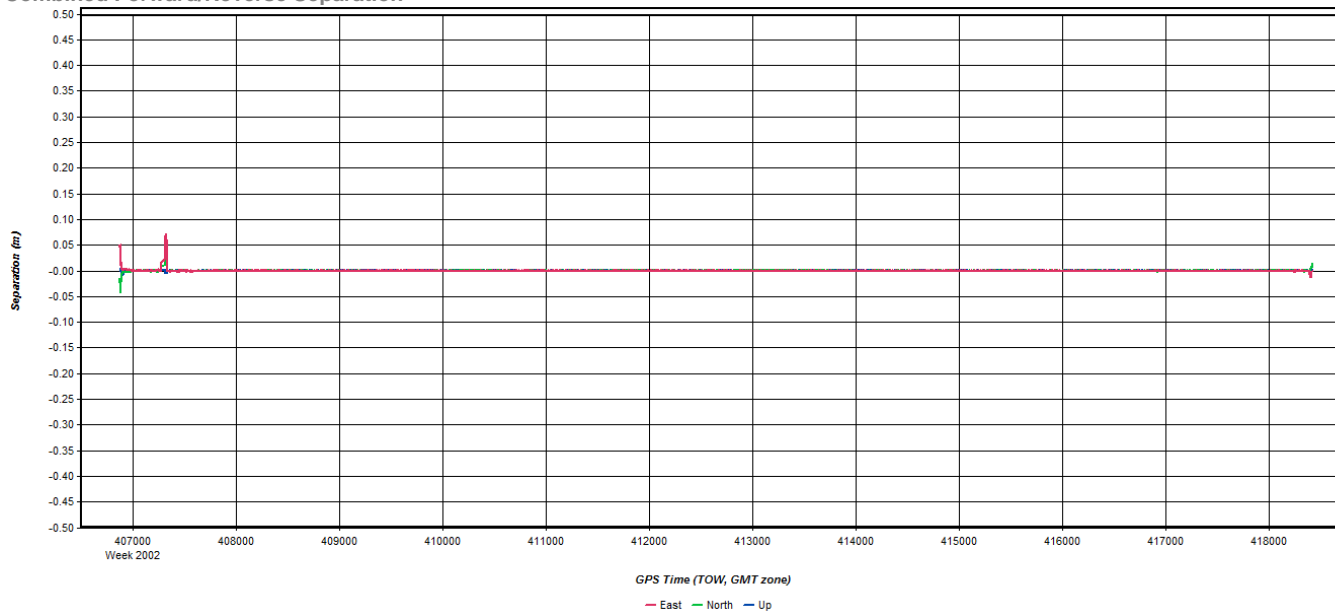
Quality Factor



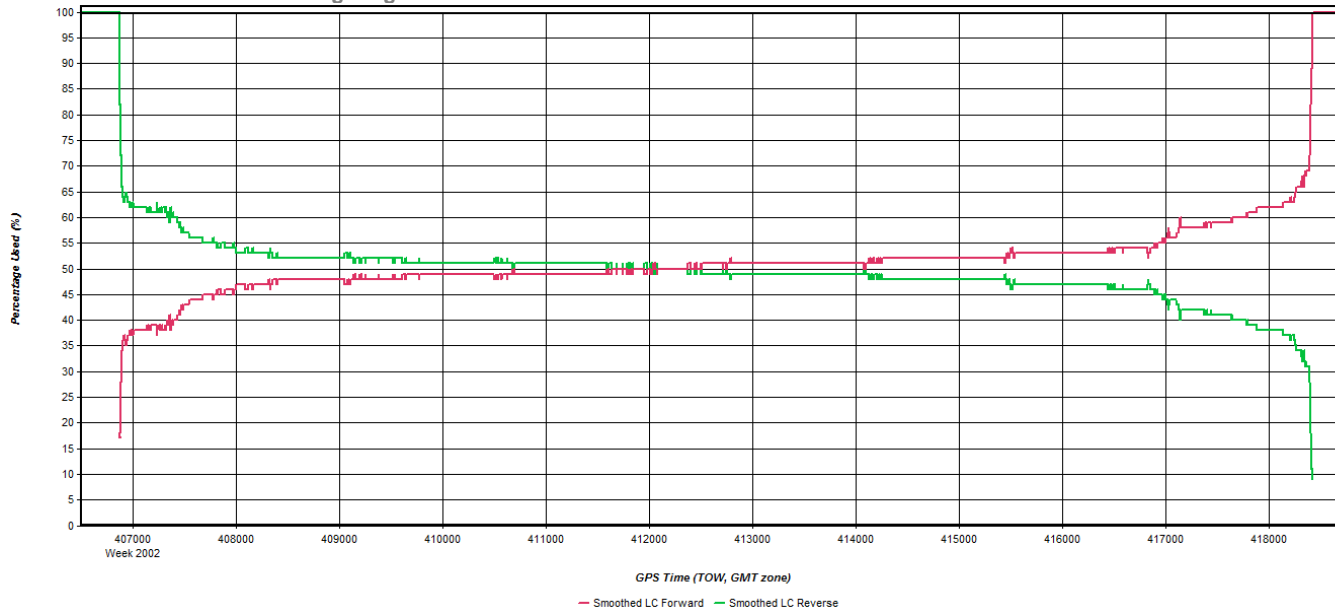
Height



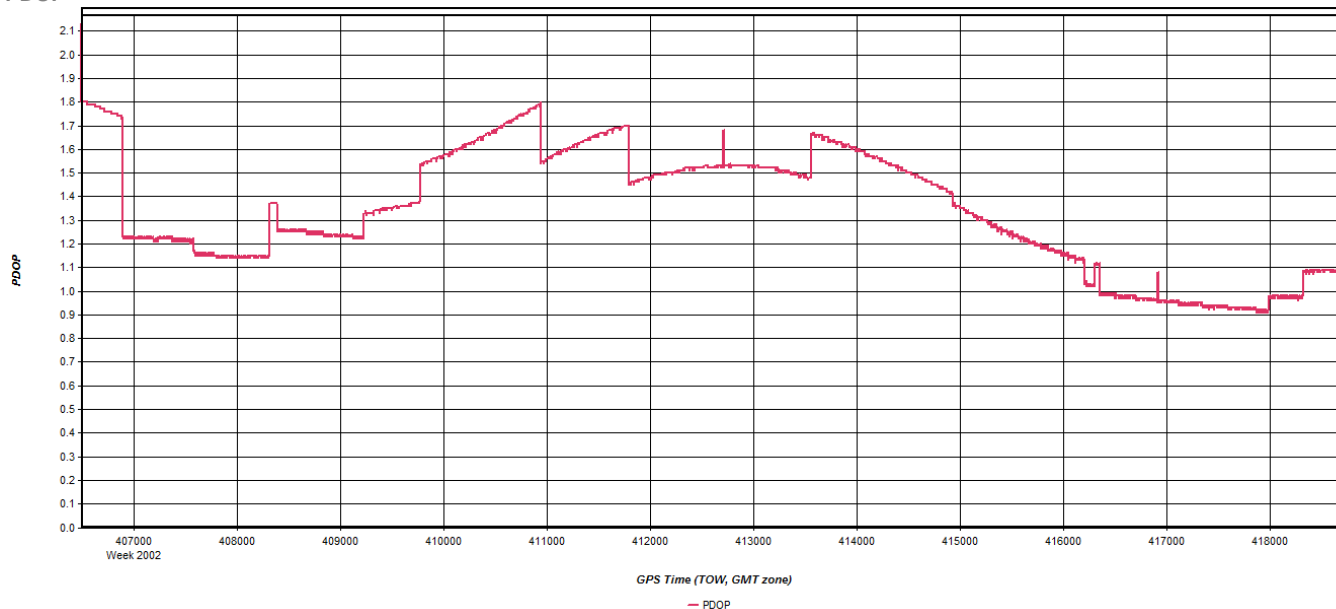
Combined Forward/Reverse Separation



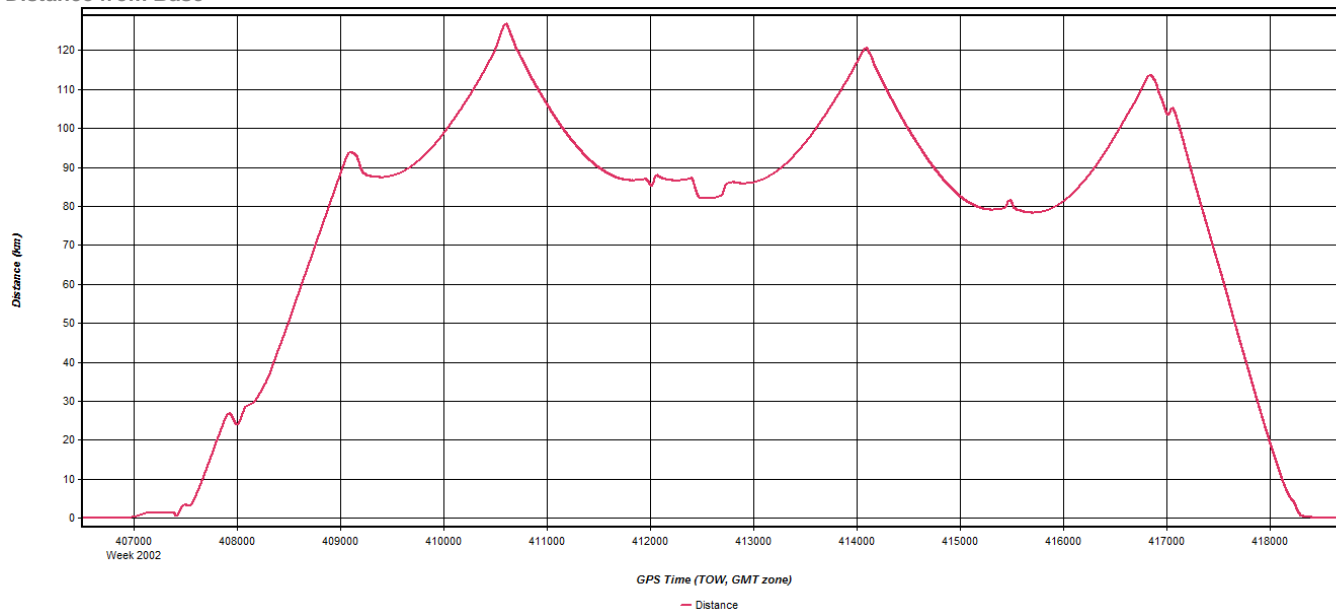
Combined Forward/Reverse Weighting



PDOP



Distance from Base





SVs



Acquisition and Processing details ----- (May 25, 2018)

Log: 180525_130_33780055_04

USGS
COLLECTION REPORT



Menu
Fugro USA Land, Inc.

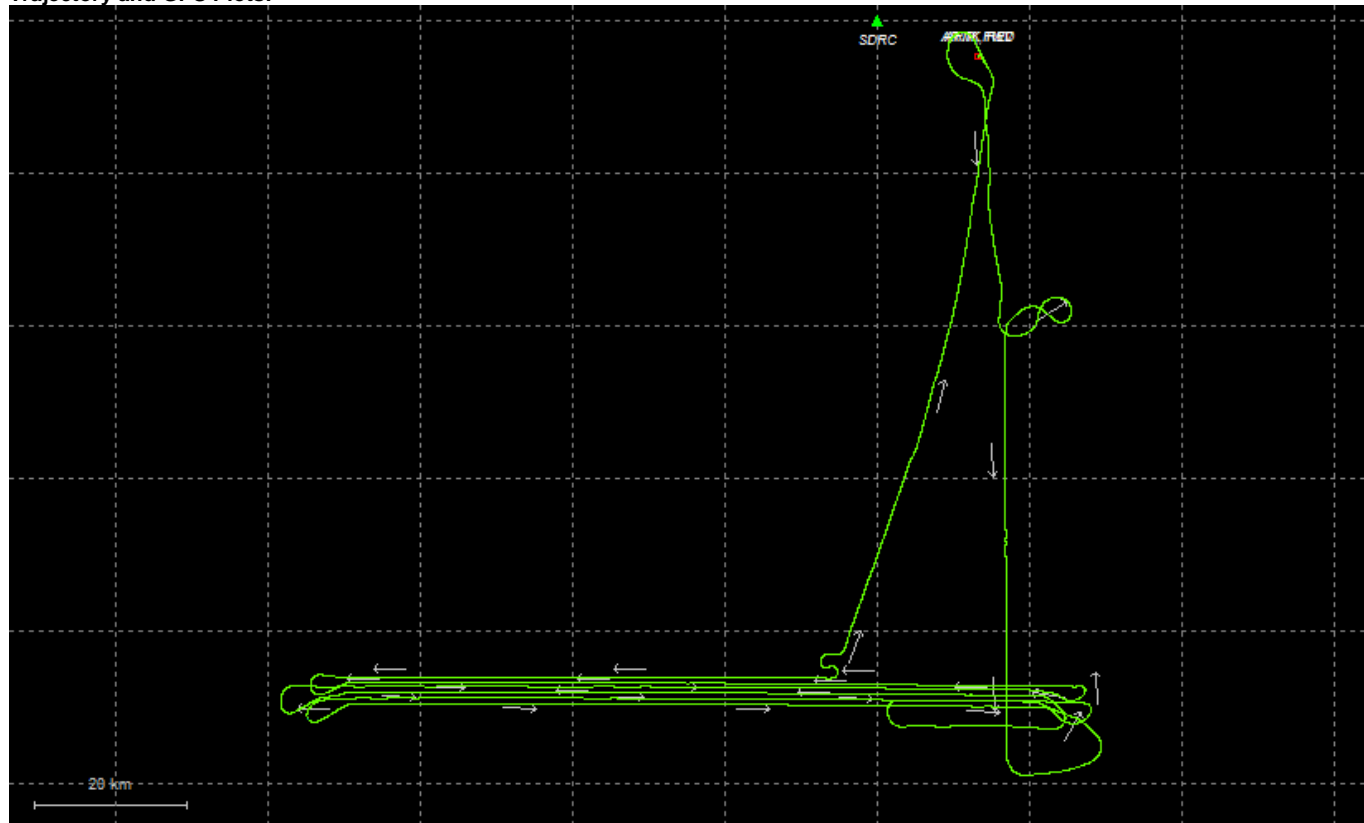
18.101	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	15:10	1117.0	KRAP	19:05	1121.1	3:55	4.00	4.1	0900-Production
2										
3										

ALS
Flight Log

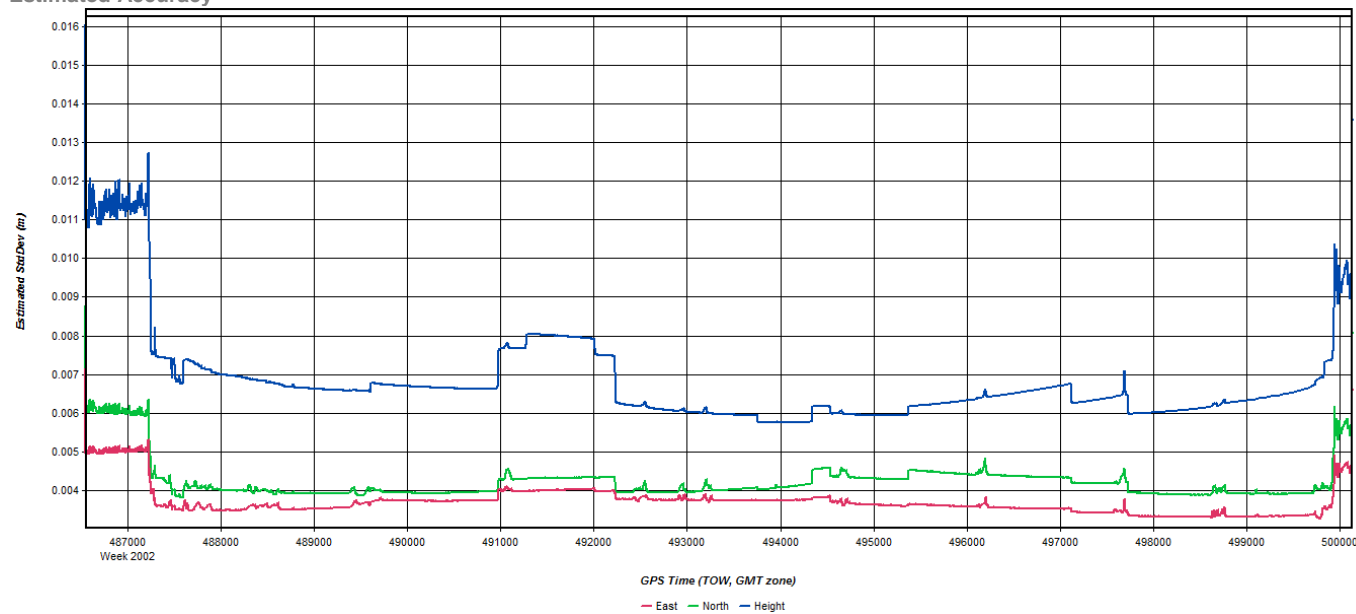
AC80-44-00-02

FGI Job #	Project Name			System	Unit	IMU	RA	SW1	SW2-Gain	Aper	AutoScan	Ground Temp °C		Min Range Gate	Data Logger Drive	
33780055	JSGS SD FY18 utm13 West ALS80			ALS80	130	uIRS	3				Yes	14.4	27.2	2231	10TB BU-07	
Flight Date	GPS Day	Lift				Sun°	Solar Times (UTC)	Laser Power	Pattern	Flying Temp °C		Max Range Gate	Download Drive			
25-May-18	18-145	4				N/A	N/A	100%	Triangle	3.0		2690	NS1TB-77			
Mission ID (yyymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	kmWPT	Altm Setting	Shipping Track				
180525_130_33780055_04	N62912	KRAP	FCMS		8,450	<150	58.0	442	23	1,549	29.93					
Pilot #1	Pilot #2	Operator #1		Operator #2												
George Jordan		Adam Mueller														
Base 1 ID	Location	Rec ID	Ant ID	ARP (m)	Start Time (UTC)	Stop Time (UTC)	GPS Filename	Operator		Data						
FGI 081	KRAP	GRD1-	GRD1-	1.8	25-May-18 11:46			Chris Fought								
Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP	
	FGI	Client's	From	To	Begin	End	Start	End								
							15:13:00	15:18:00					Ground Static	16	1.6	
							15:37:55	15:41:32					S Turn	20	1.2	
ALS13GX	2		31	1	46.5	0	15:44:47	15:55:40	S	11101	141	53.0	Cross line	22	1.2	
ALS13G	59		57	1	86.7	0	16:02:25	16:22:24	W	11609	140	53.0	km 50 slight drift ; km 31 drift	22	1.1	
			58	1	57	0	86.7	16:26:21	16:46:27	E	11609	140	53.0		21	1.1
			58	57	47	86.7	71.3	16:51:02	16:54:31	W	11609	145	53.0	Calibration Line	21	1.1
			57	57	1	86.7	0	17:01:23	17:21:24	W	11609	140	53.0		19	1.2
			56	1	57	0	86.7	17:27:15	17:47:34	E	11616	140	53.0	km 54 altitude	22	1.0
			55	57	1	86.7	0	17:51:55	18:12:23	W	11616	140	53.0		19	1.2
			54	1		0		18:15:58	18:29:09	E	11622	140	53.0		21	1.1
								18:30:20	18:32:16				S turn	19	1.2	
								18:52:11	18:55:11				Ground Static			

Trajectory and GPS Plots:

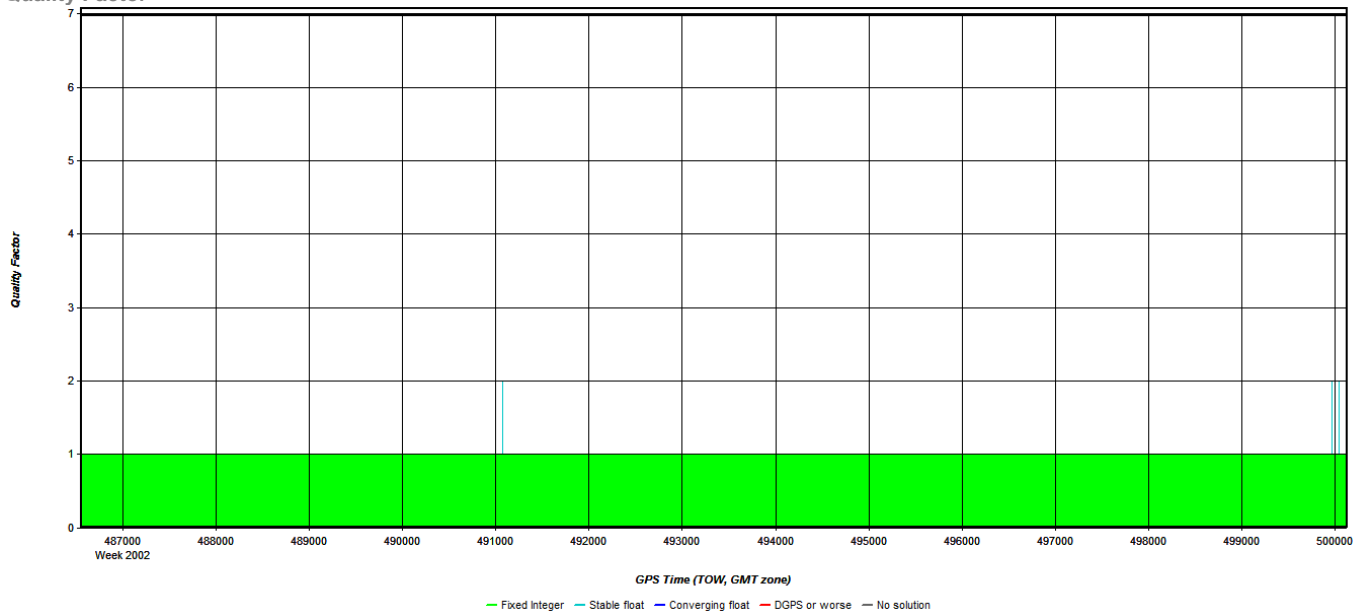


Estimated Accuracy

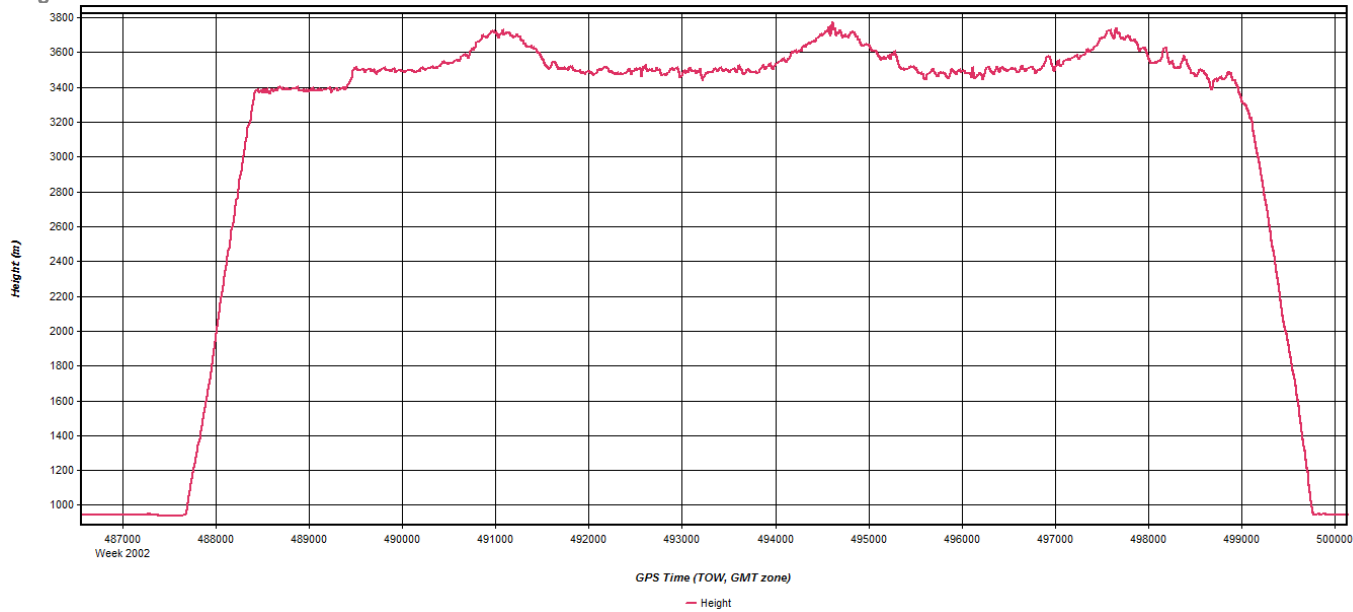




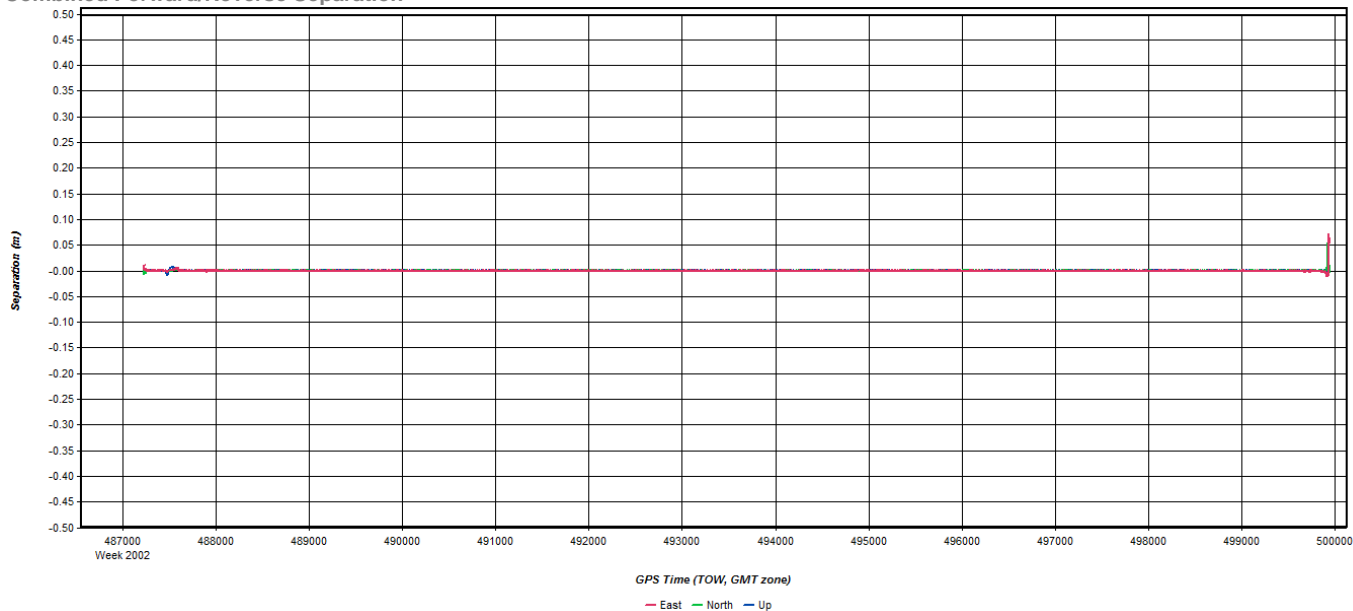
Quality Factor



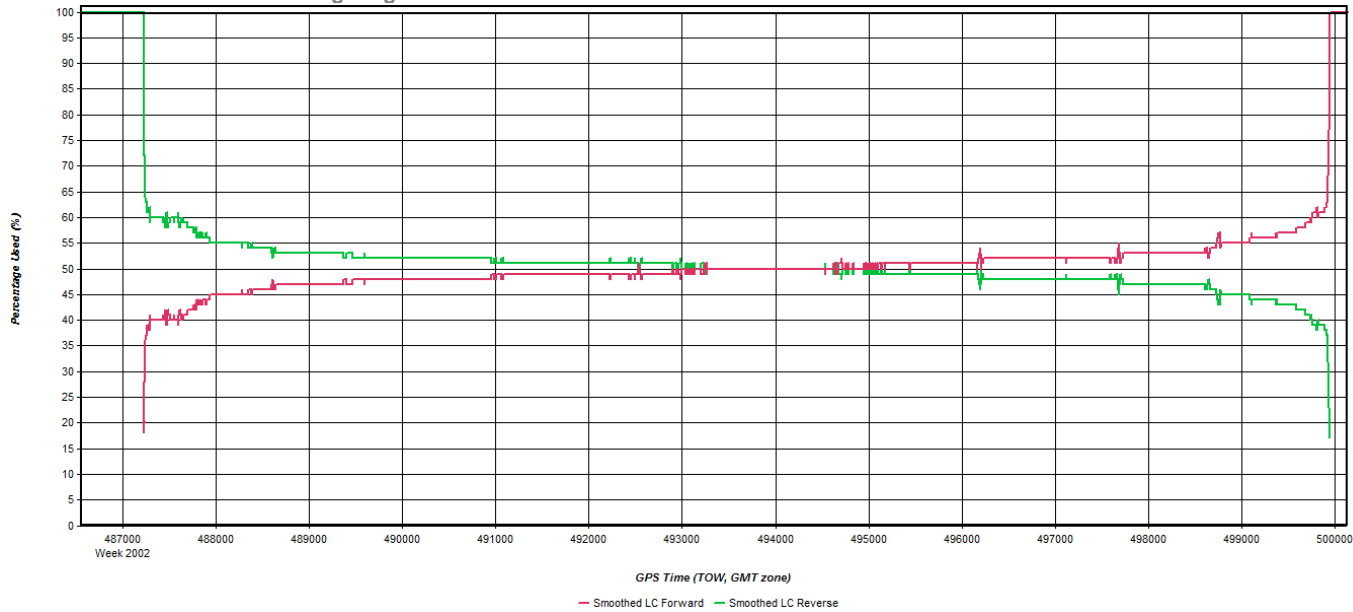
Height



Combined Forward/Reverse Separation

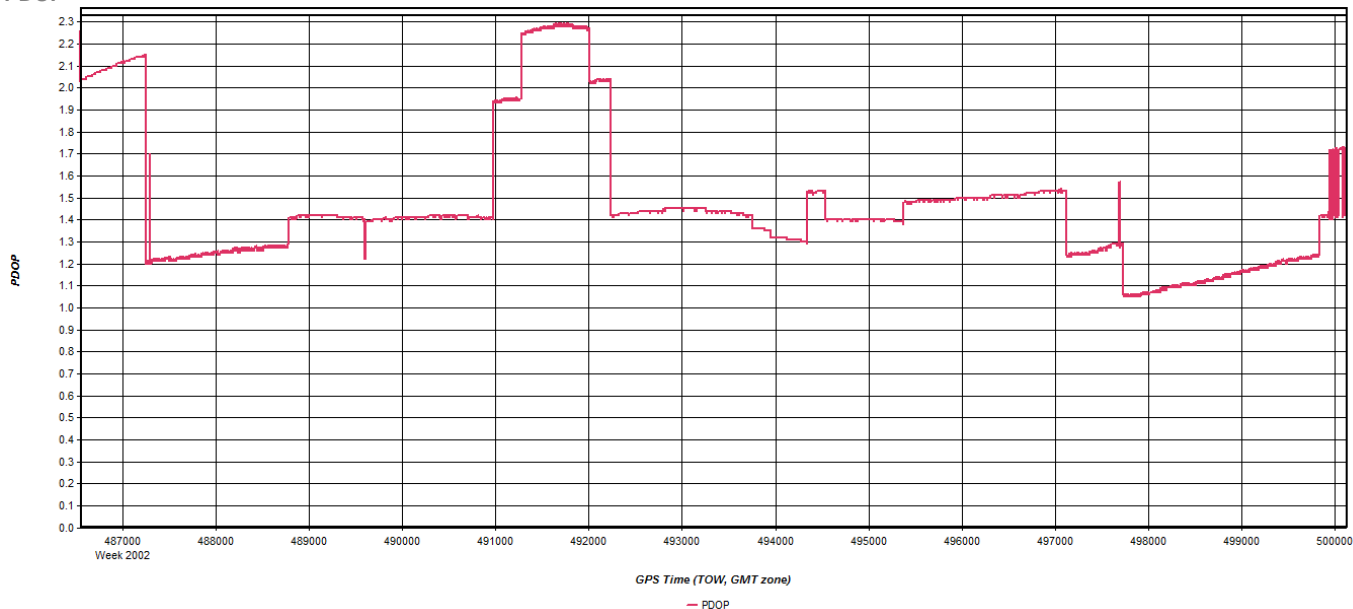


Combined Forward/Reverse Weighting

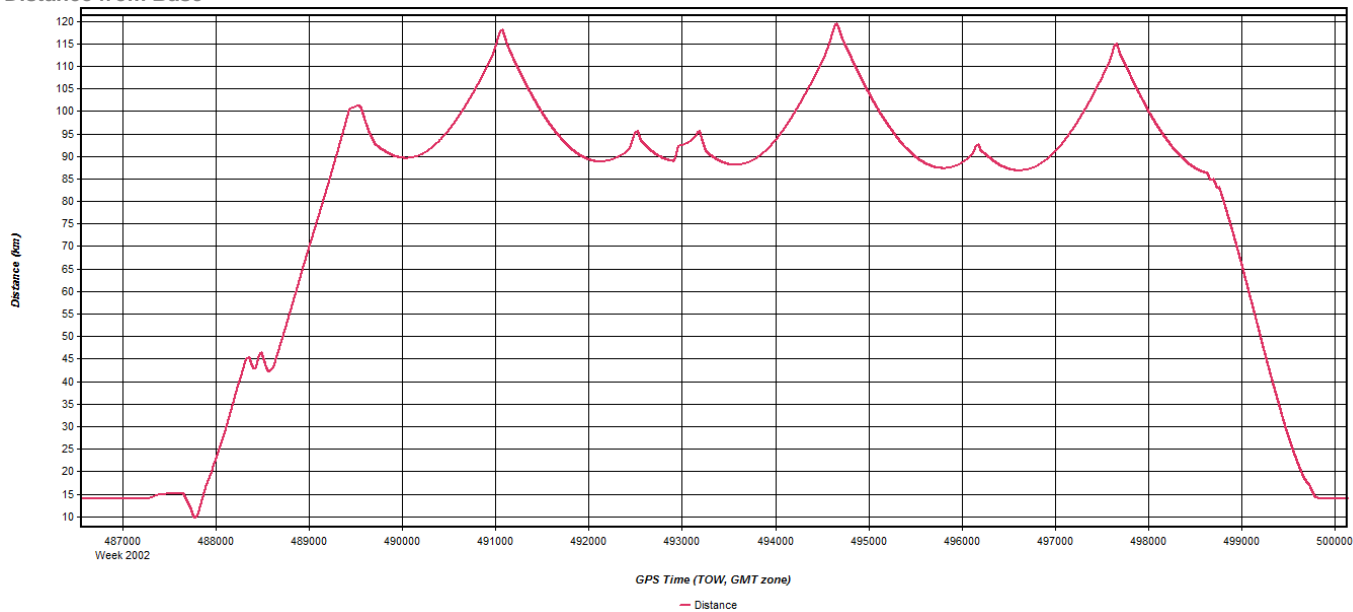




PDOP

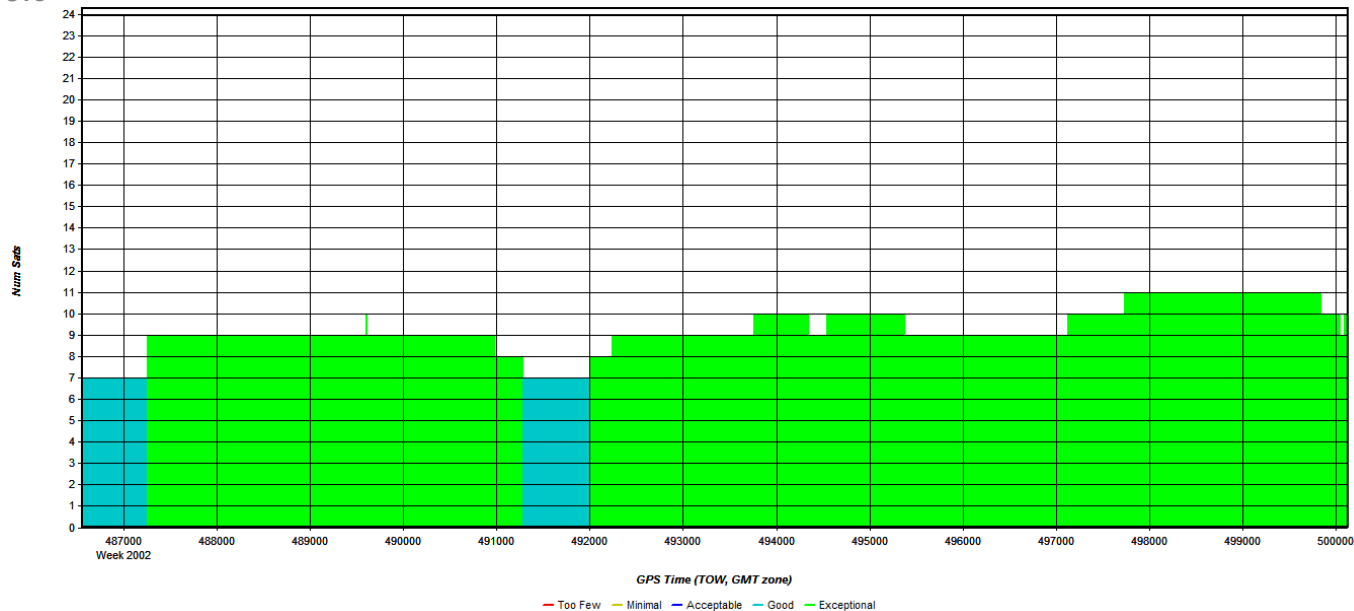


Distance from Base





SVs



Acquisition and Processing details ----- (May 25, 2018)

Log: 180525_165_33780055_32

USGS
COLLECTION REPORT



Fugro USA Land, Inc.

18.01	Lift Begin			Lift End			Fit Duration	Fit Hrs	Hobbs Hrs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs				
1	KRAP	16:26	1147.9	KRAP	22:28	1153.6	6:02	6.00	5.7	0900-Production
2										
3										



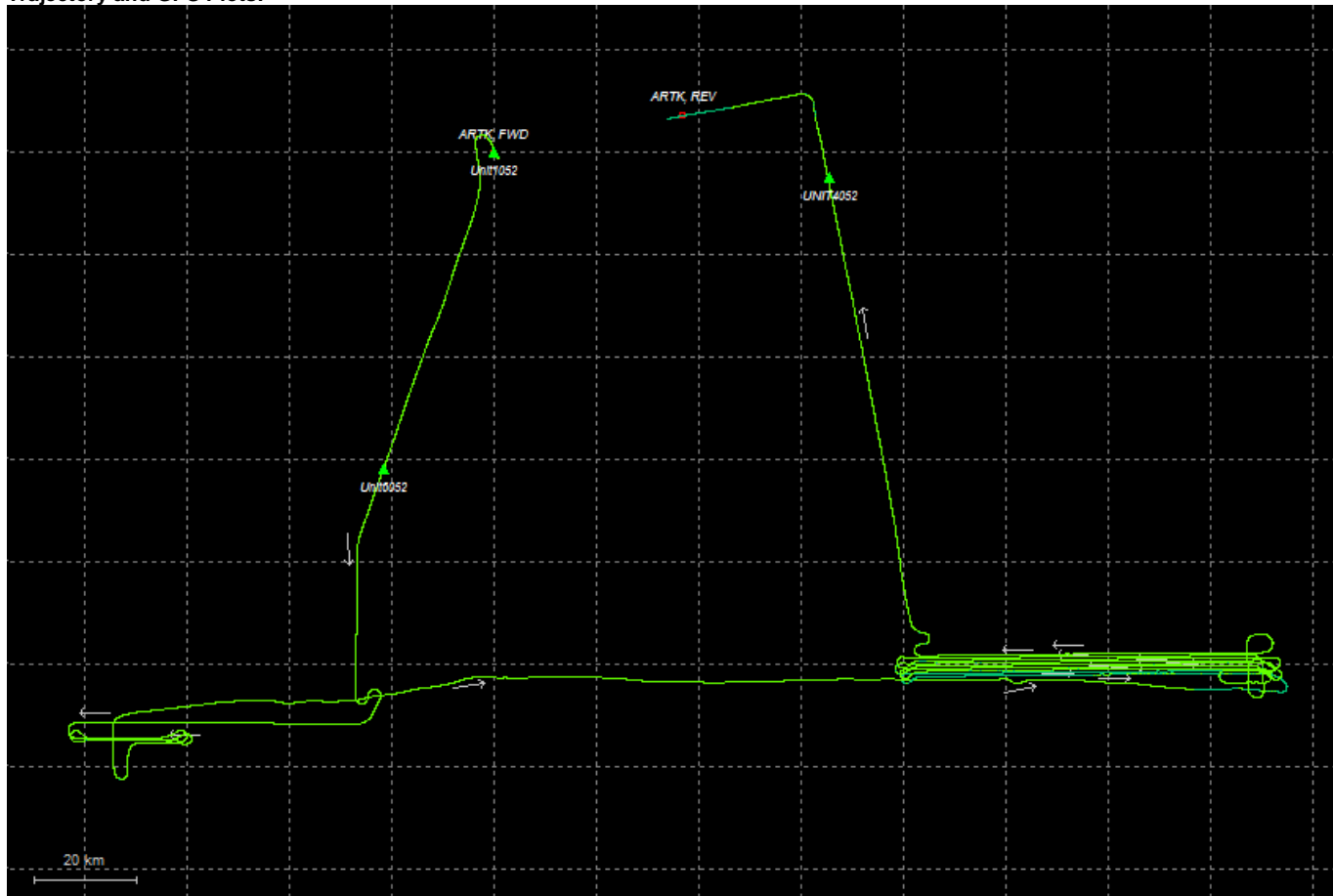
AC80-50-00-02

FGI Job # 04.33780055	Project Name USGS SD FY2018		System 680i	Unit 165	IMU				Ground Temp °C 26.0 26.0	Min Range' 1542	Data Logger Drives DR680-14	
Flight Date 25-May-18	GPS Day 18-145	Lift 32		Sun° NA	Solar Times (UTC) NA	Pulse Rate 330		Flying Temp °C 19.0 22.0	Max Range' 2933	Download Drive		
Mission ID (yyymmdd_Sen_Job_Lift) 180525_165_33780055_32	Aircraft N97HC	Airport ID KRAP	FMS CCNS 5	UTC 2400	AMT (ft) 130	Speed FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	Altitude Setting 29.93 29.90	Humidity @ Alt	Shipping Track

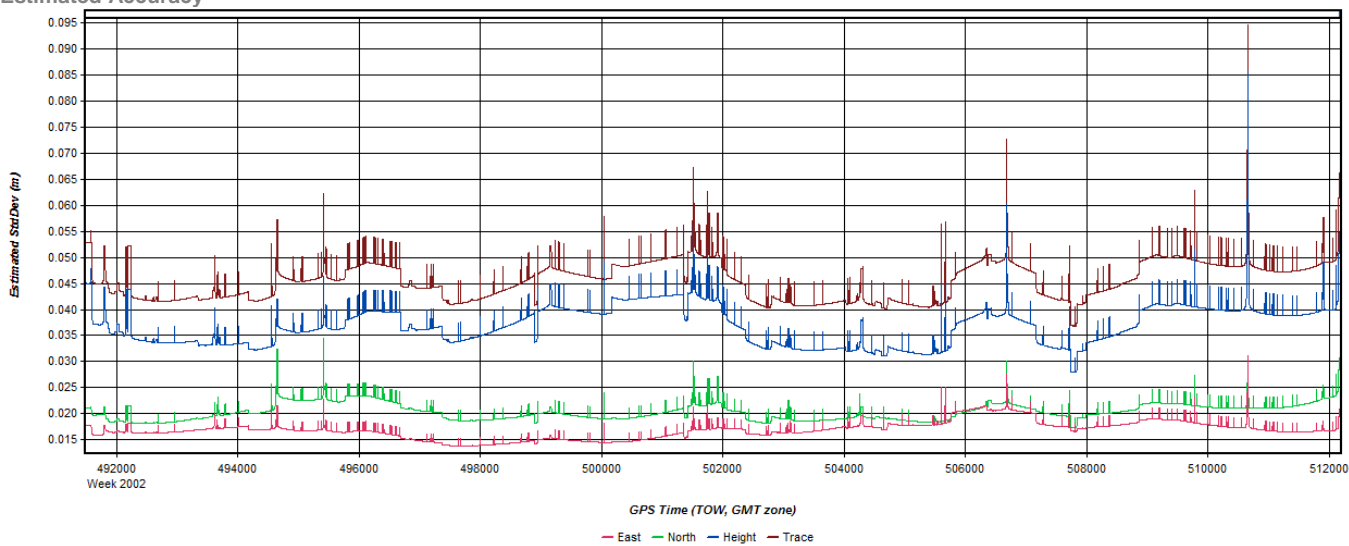
Pilot #1 Grant Cassell		Pilot #2		Operator #1 Jonathan Spencer		Operator #2					
Base 1 ID 7002	Location Buffalo Gap	Rec ID GR3	Ant ID U6	ARP (m) 1.8	Start Time (UTC) 24-May-18 14:59	Stop Time (UTC)	GPS Filename	Operator Chris Acufia	Data FTP		
Base 3 ID FEDI 1050	Location Wall, SD	Rec ID GR3	Ant ID U4	ARP (m) 1.8	Start Time (UTC) 24-May-18 18:19	Stop Time (UTC)	GPS Filename	Operator Chris Acufia	Data FTP		

Area	Flight #		Wpt		Distance		UTC		Fit Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							16:54:21	16:59:21					Overfly of Buffalo Gap	18	1.2
							17:05:48	17:07:57					S-turn	19	1.1
RGL_W13F	45		119	103	51.9	44.9	17:10:01	17:12:04	W	6,297	123	130.0	re-flight	20	1.0
	45		12	1	4.8	0	17:21:15	17:22:37	W	6,297	122	130.0	re-flight	20	1.1
	50		8	33	3.1	14.1	17:24:57	17:28:01	E	6,197	125	130.0	re-flight	20	1.0
	51		35	8	15	3.1	17:31:25	17:34:51	W	6,197	123	130.0	re-flight	20	1.0
	51		8	35	3.1	15	17:37:49	17:41:04	E	6,197	127	130.0	calibration line	19	1.1
	52		35	29	15	12.3	17:44:47	17:45:43	W	6,147	124	130.0	re-flight	18	1.2
RGL_W13X	1		5	14	1.8	5.7	17:49:41	17:50:54	N	6,147	128	130.0	crossing line	19	1.1
RGL_14E	28		54	59	23.3	25.5	18:25:35	18:28:41	E	5,534	125	130.0	re-flight	18	1.2
	30		147	1	64.2	0	18:40:50	18:57:41	W	5,484	127	130.0		18	1.2
	31		1	147	0	64.2	19:00:05	19:16:51	E	5,484	128	130.0		19	1.1
	31		147	137	64.2	59.8	19:20:12	19:21:37	W	5,484	122	130.0	calibration line	18	1.1
	32		147	1	64.2	0	19:26:21	19:43:27	W	5,484	123	130.0		18	1.0
	33		1	147	0	64.2	19:46:01	20:02:59	E	5,484	125	130.0		20	0.9
	34		147	1	64.2	0	20:05:35	20:22:38	W	5,484	123	130.0		19	1.0
	35		1	147	0	64.2	20:25:41	20:42:47	E	5,384	123	130.0		18	1.0
	36		147	1	64.2	0	20:46:07	21:03:29	W	5,384	121	130.0		18	1.0
	37		1	147	0	64.2	21:06:30	21:23:16	E	5,384	128	130.0		17	1.1
RGL_14X	1		35	49	15	21.1	21:27:15	21:29:02	N	5,125	120	130.0	crossing line	16	1.3
RGL_14E	38		147	1	64.2	0	21:32:02	21:49:02	W	5,584	124	130.0		16	1.3
							21:49:11	21:51:07					S-turn	17	1.1
							22:06:00	22:11:00					Overfly of Wall, SD	16	1.2

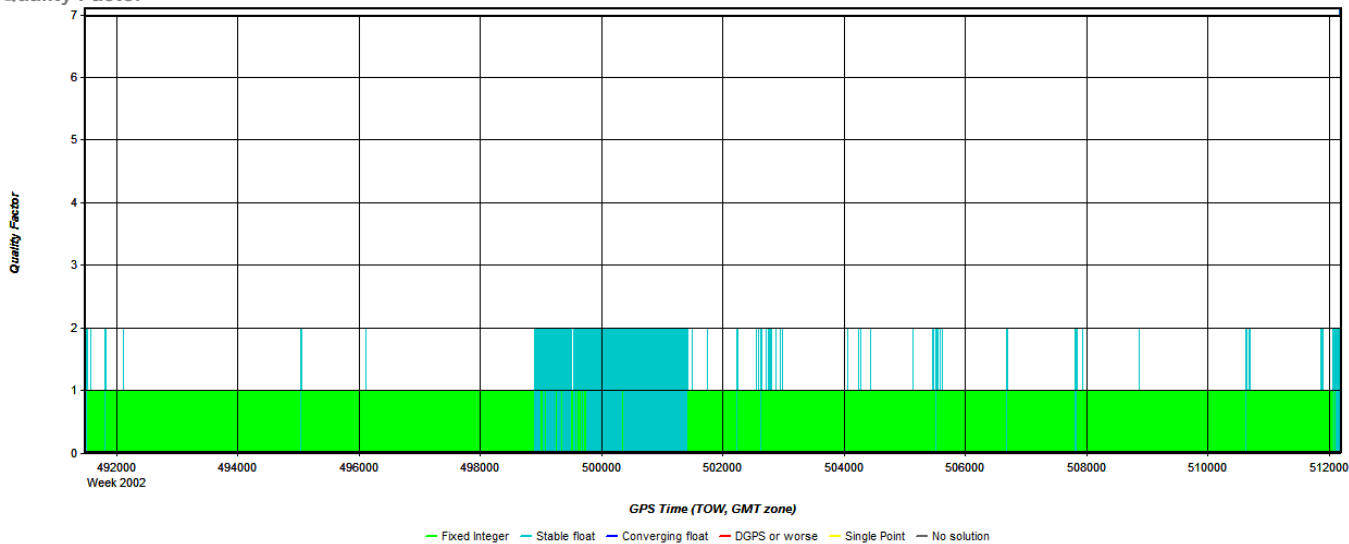
Trajectory and GPS Plots:



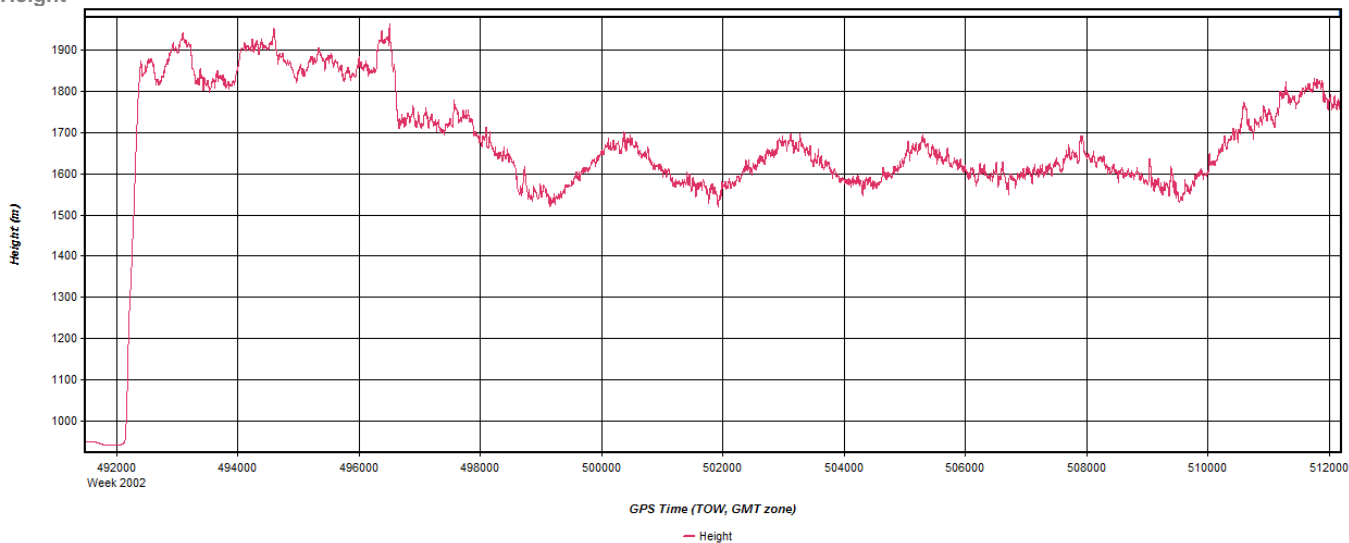
Estimated Accuracy



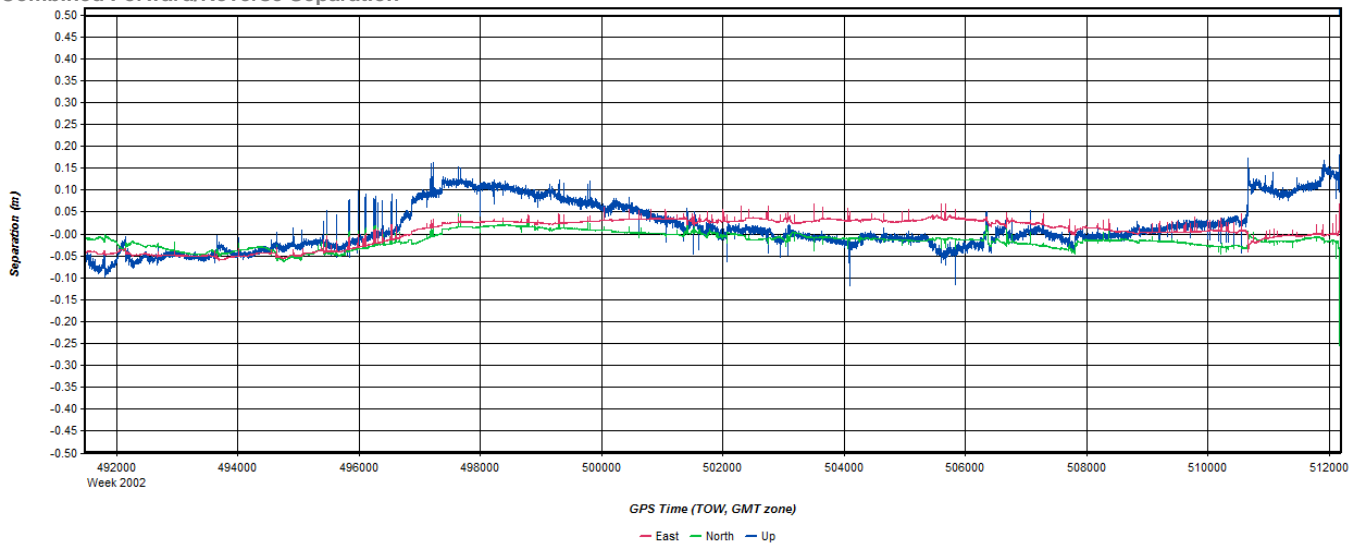
Quality Factor



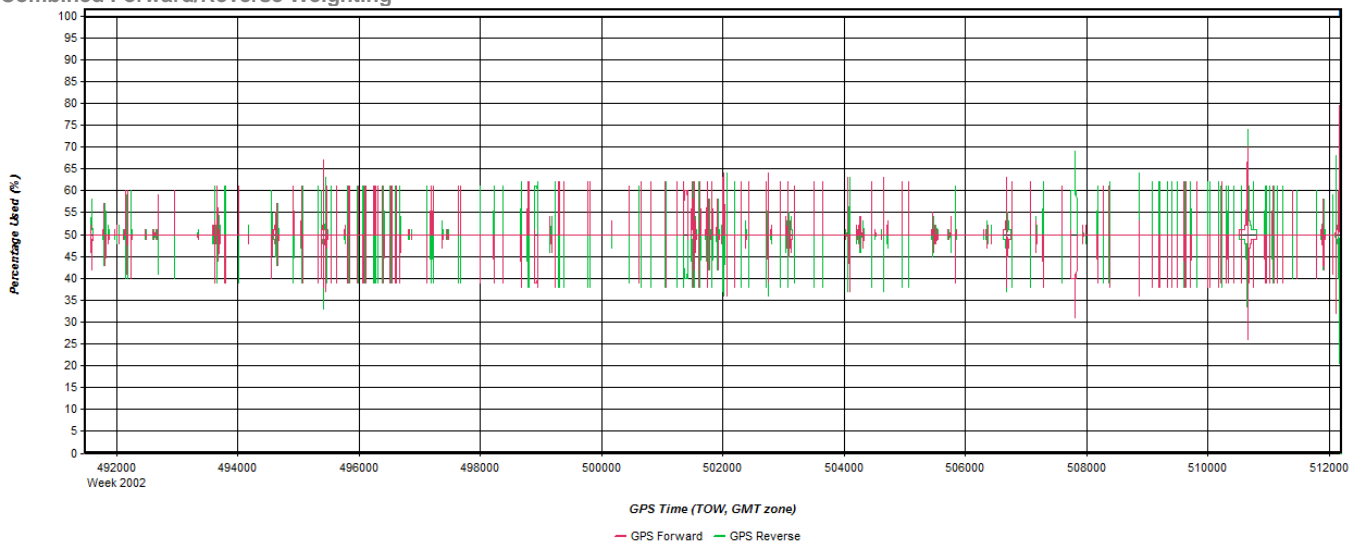
Height



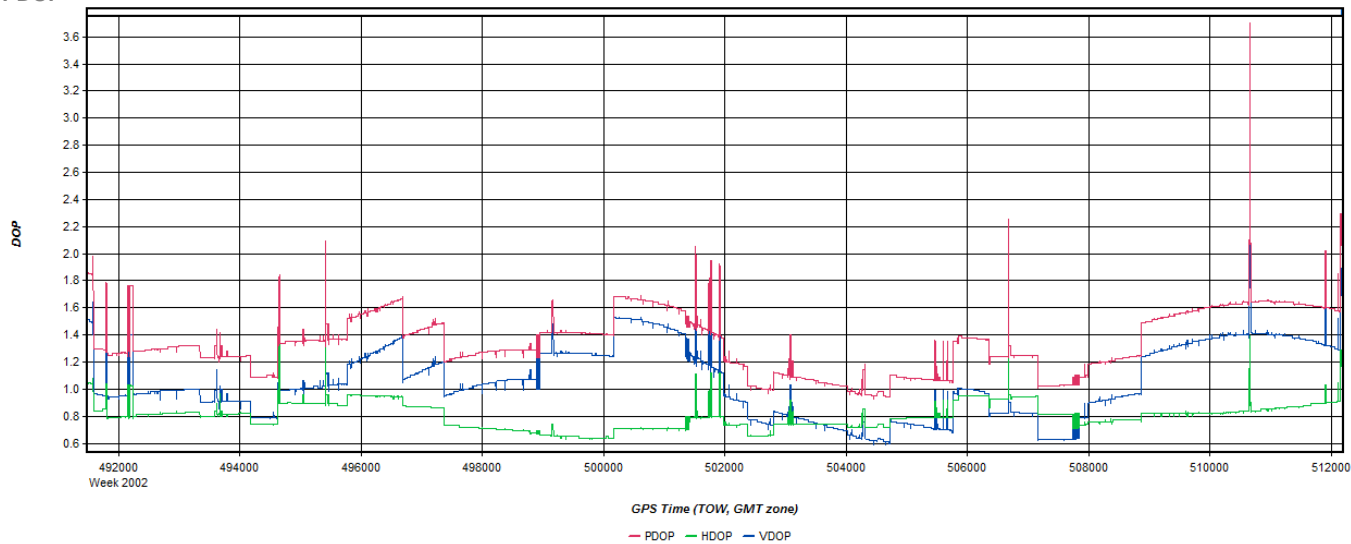
Combined Forward/Reverse Separation



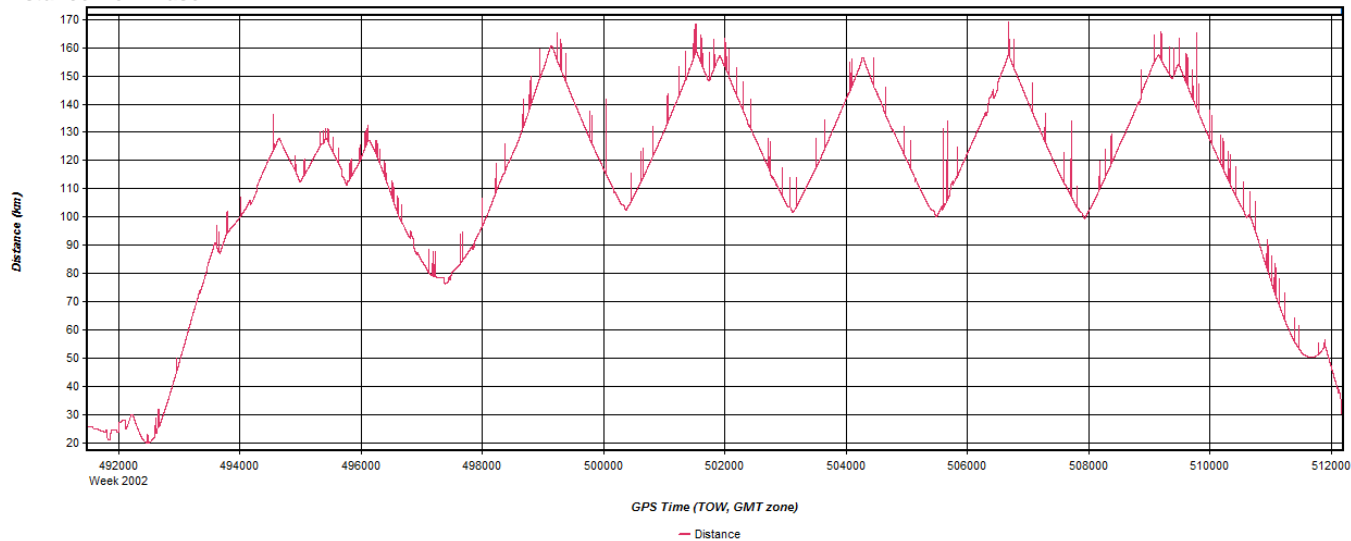
Combined Forward/Reverse Weighting



PDOP

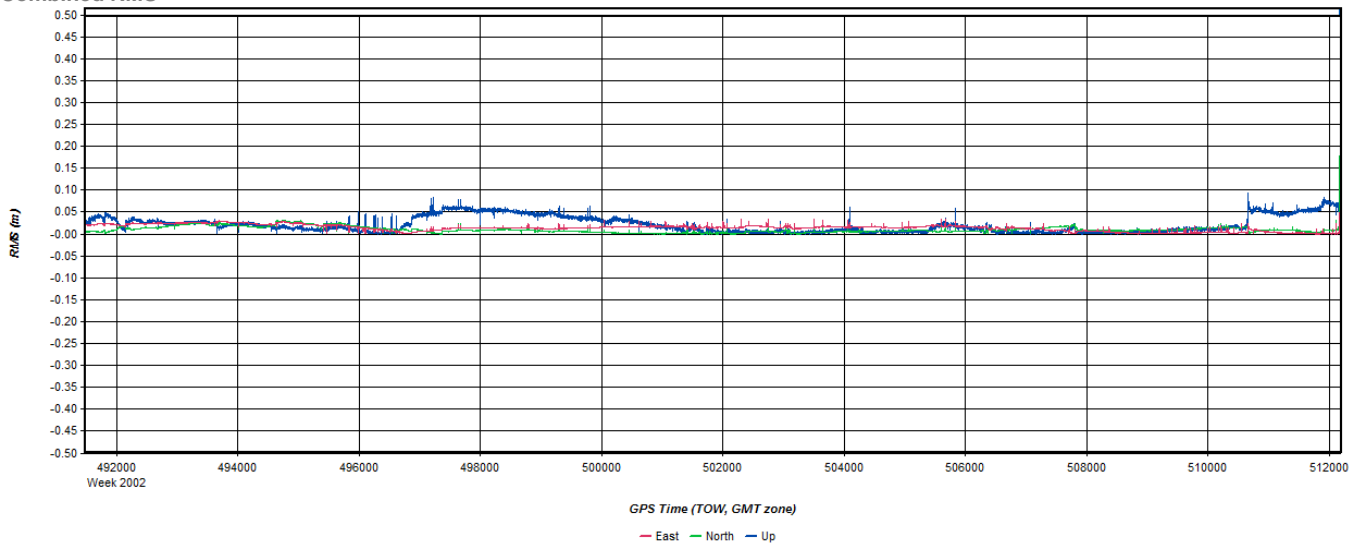


Distance from Base

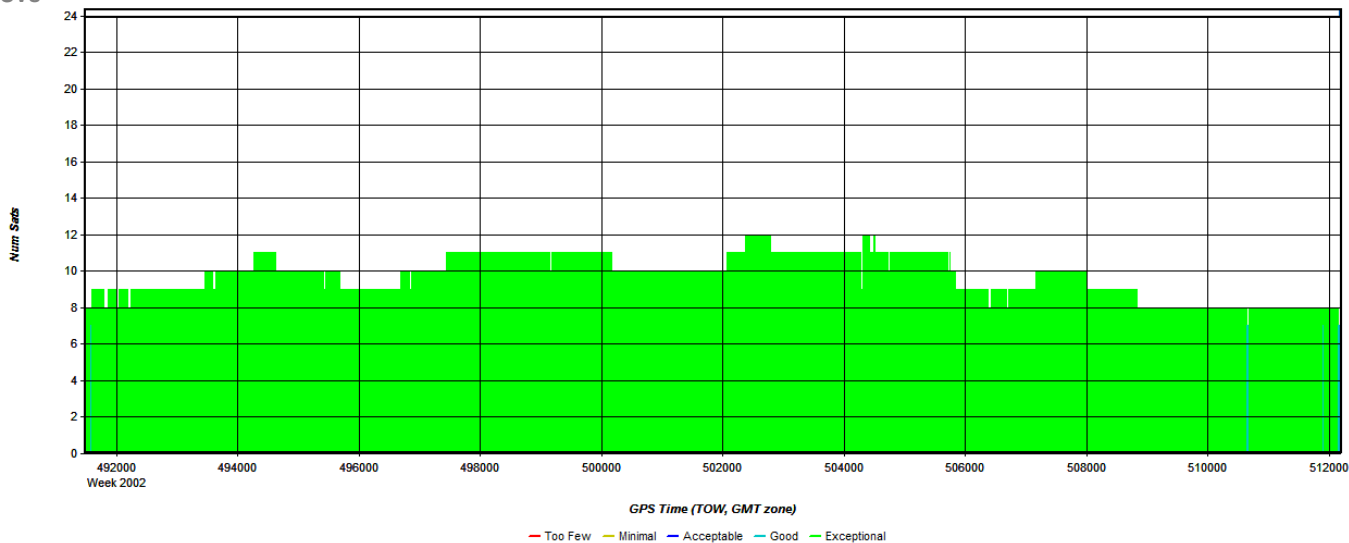




Combined RMS



SVs



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COLLECTION REPORT**



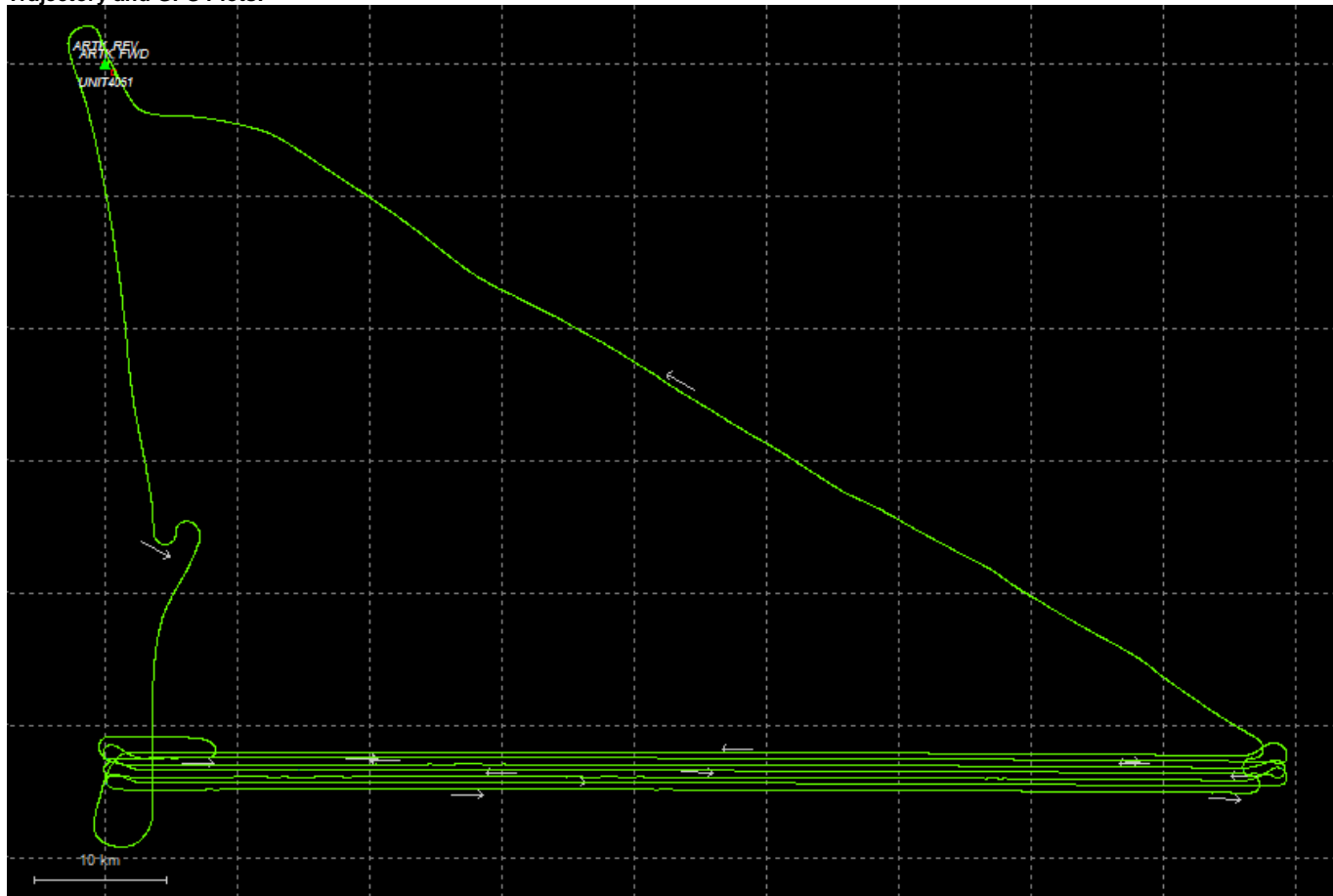
Acquisition and Processing details ----- (May 25, 2018)

Log: 180525_421_33780055_10

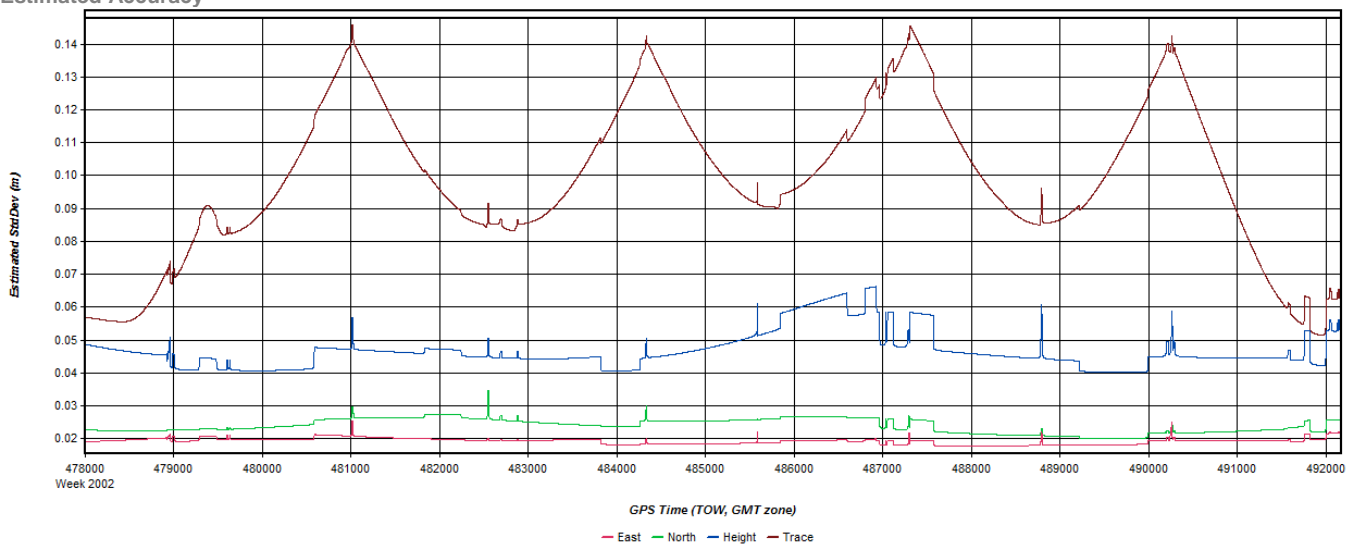
18.01	Lift Begin			Lift End			Flt	Flt	Hobbs	Activity
	Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs	
1	KRAP	12:34	2261.2	KRAP	16:48	2265.0	4:14	4.25	3.8	0900-Production
2										
3										

FUGRO		Fugro USA Land, Inc.		Riegl		Flight Log		AC80-50-00-02							
FGI Job # 33780055	Project Name SD USGS FY18			System 780	Unit 421	IMU AIMU		Ground Temp °C 15.0 25.0	Min Range' 1542	Data Logger Drives 2					
Flight Date 25-May-18	GPS Day 18-145	Lift 10		Sun°	Solar Times (UTC)	Pulse Rate 330		Flying Temp °C 23.0 24.0	Max Range' 2933	Download Drive					
Mission ID (yyymmdd_Sen_Job_Lift) 180525_421_33780055_10		Aircraft N88N	Airport ID KRAP	FMS CCNS 6	UTC -6	AMT (ft) 2400	Speed 130	FOV	Scan Rate (Hz) 130	MTA 2	km/WPT 0.440	AltM Setting 29.92 29.93	Humidity @ Alt 77	Shipping Track	
Pilot #1 Rachel Hedman		Pilot #2		Operator #1 Riley Forsyth		Operator #2									
Base 1 ID FGI 081	Location Rapid City, SD		Rec ID GR3-1	Ant ID GR3-1	ARP (m) 1.8	Start Time (UTC)	Stop Time (UTC)	GPS Filename	Operator Adam Mueller	Data					
Area	Flight #		Wpt		Distance		UTC		Flt Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions	SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End							
							12:39:00	12:44:00					ground static at KRAP	15	1.3
							13:01:30						s turn	15	1.1
13CX	1		15	1	6.2	0	13:06:23	13:08:12	S	5,168	125		cross tie line	15	1.1
13C	62		1	188	0	82.3	13:12:29	13:35:24	E	5,068	114			15	1.1
	63		188	1	82.3	0	13:37:32	14:00:56	W	4,873	103			16	1.0
	63		1	10	0	4	14:02:49	14:04:20	E	5,194	105		calibration line	16	1.0
	64		1	188	0	82.3	14:08:14	14:31:09	E	5,227	115			16	1.0
	65		188	1	82.3	0	14:32:56	14:55:54	W	4,970	115			17	1.0
	66		1	188	0	82.3	14:57:42	15:20:17	E	5,229	109			17	1.1
	67		188	1	82.3	0	15:22:19	15:45:16	W	4,999	114			16	1.1
	68		1	188	0	82.3	15:46:55	16:09:34	E	5,217	115			18	1.0
							16:09:48						s turn	18	1.0
							16:41:00	16:46:00					ground static at KRAP	14	1.1

Trajectory and GPS Plots:

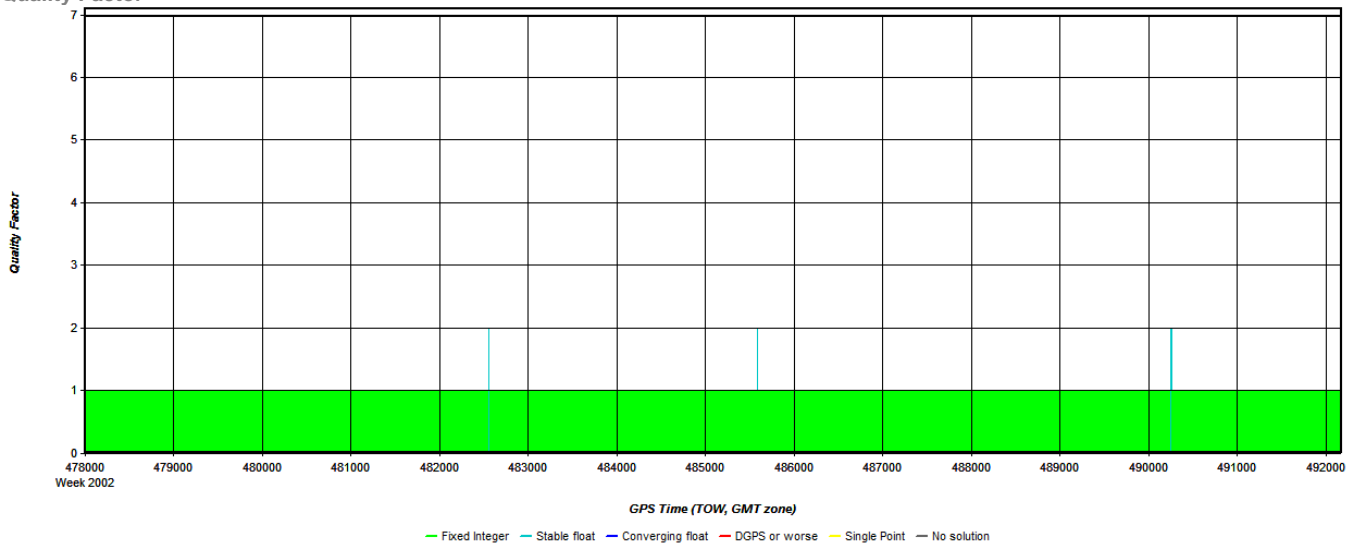


Estimated Accuracy

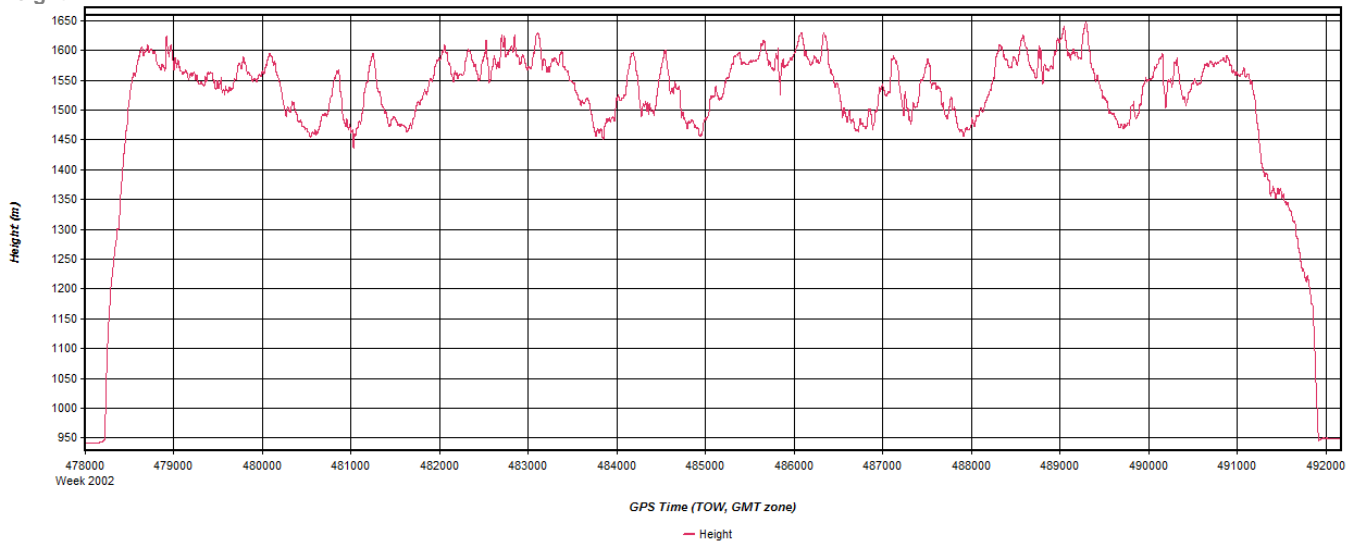




Quality Factor

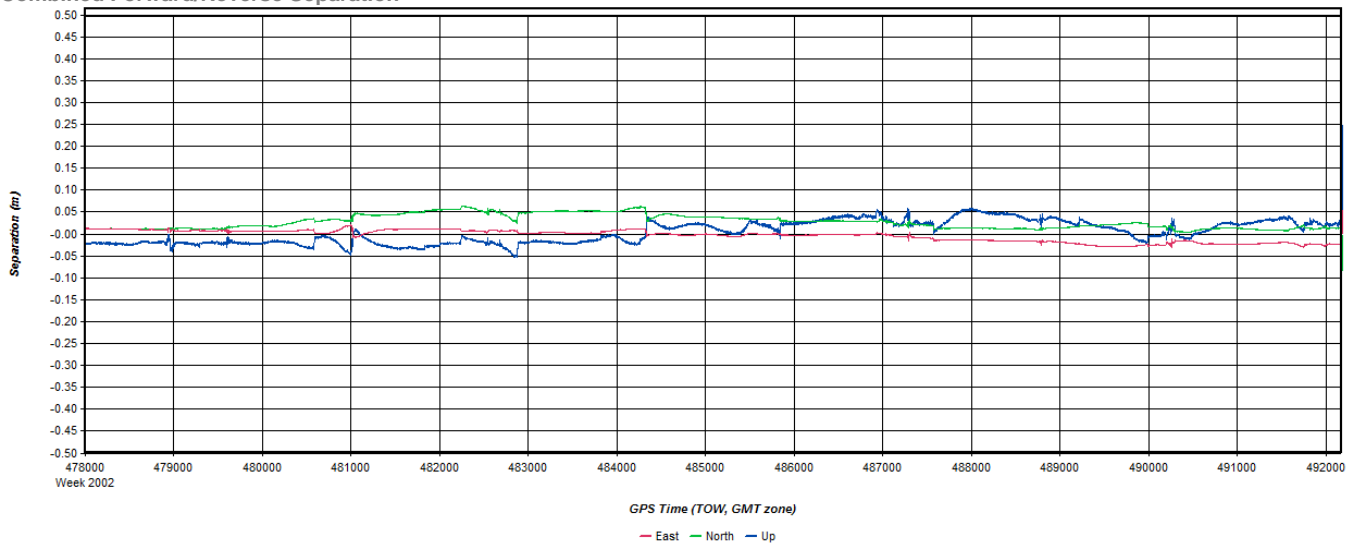


Height

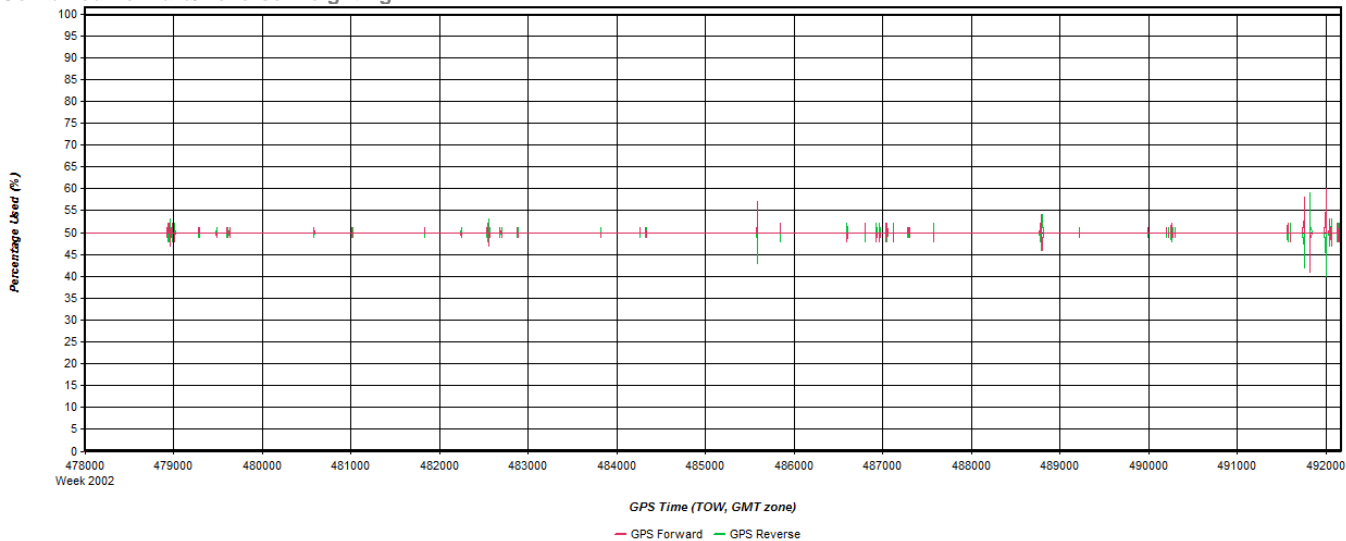




Combined Forward/Reverse Separation

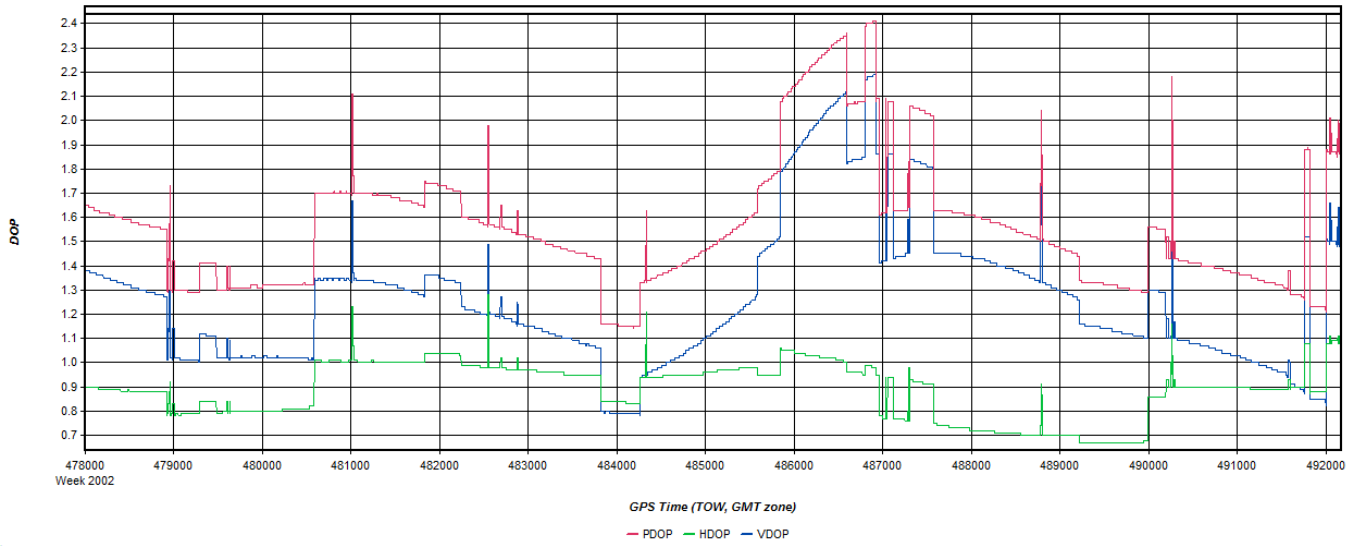


Combined Forward/Reverse Weighting

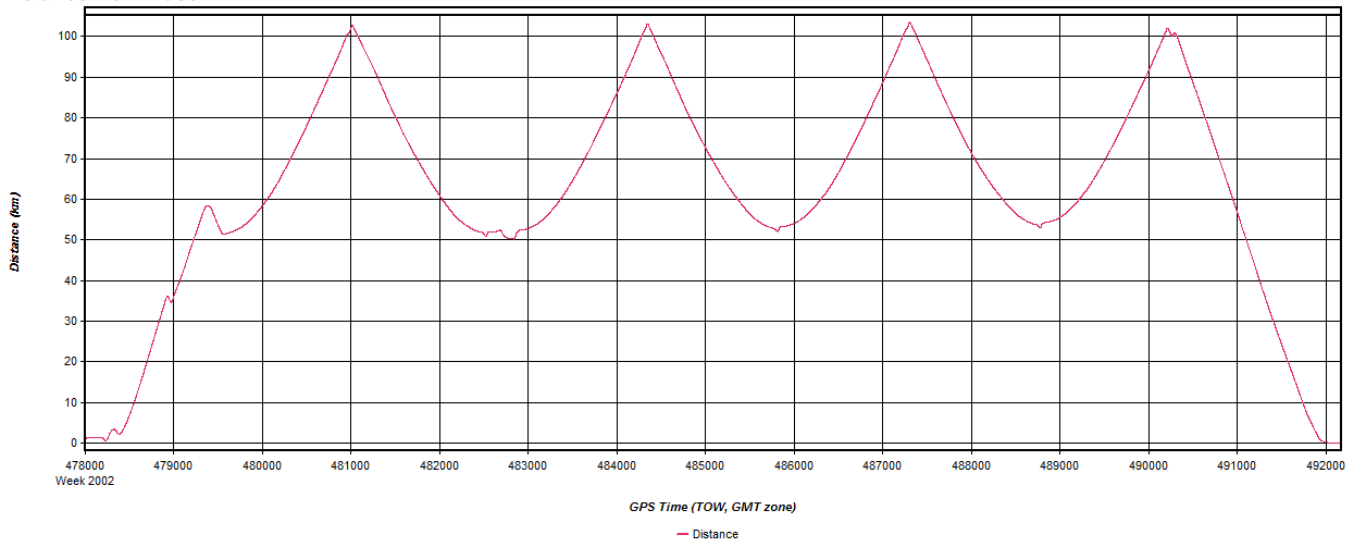


**USGS
COLLECTION REPORT**

PDOP

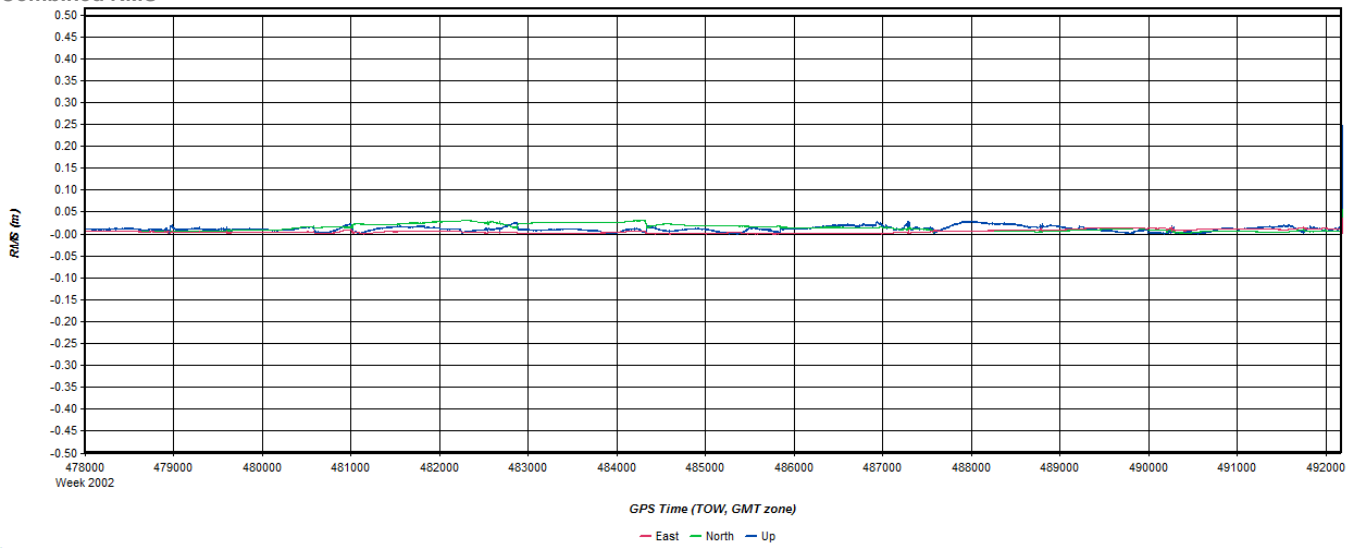


Distance from Base

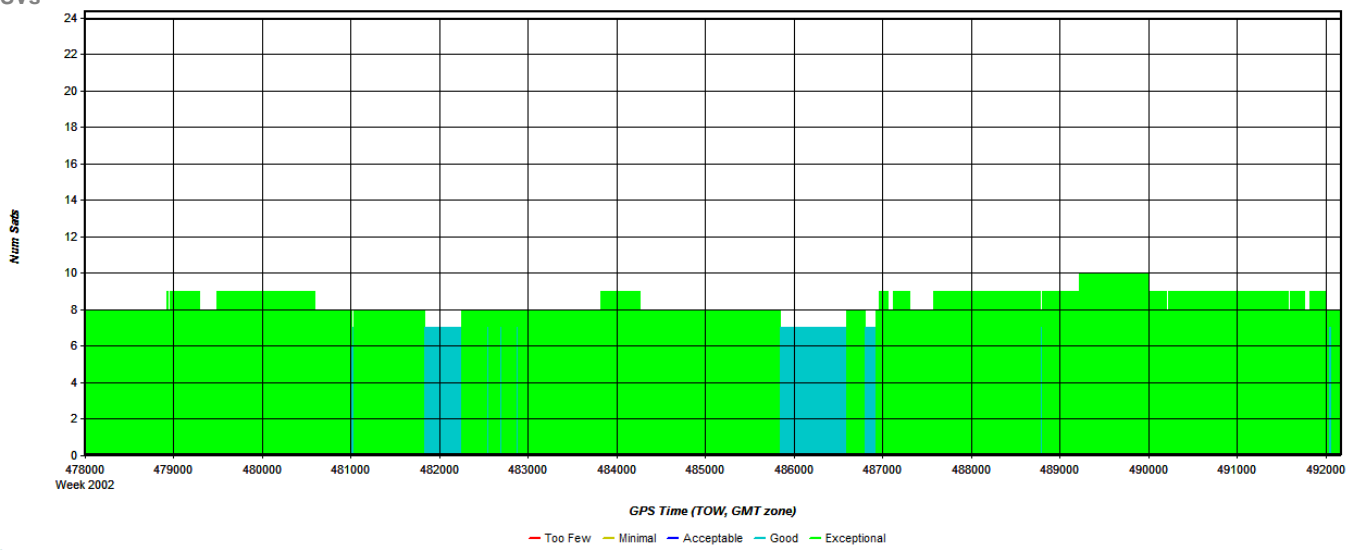


USGS COLLECTION REPORT

Combined RMS



SVs



**USGS
COLLECTION REPORT**

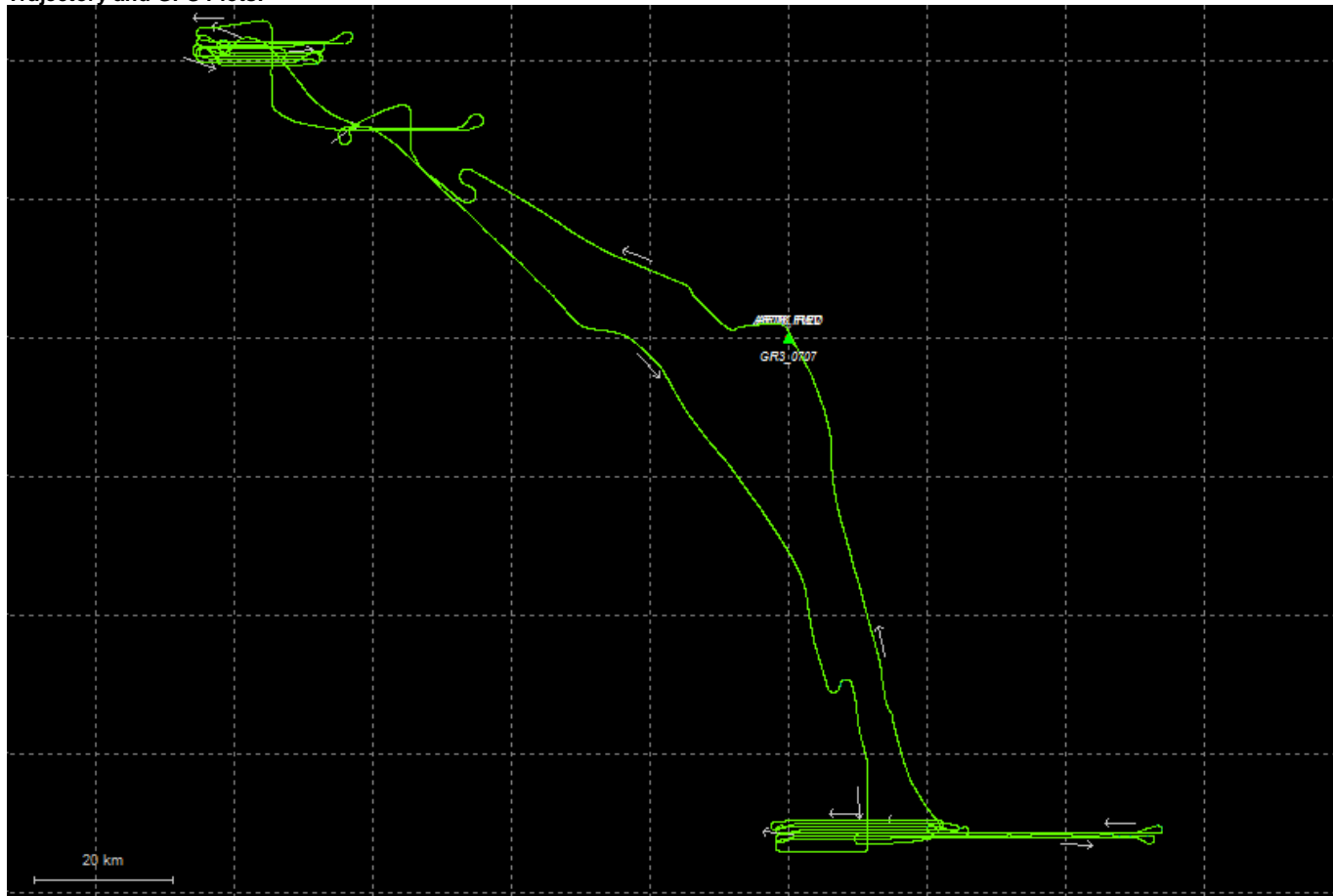


Acquisition and Processing details ----- (July 2, 2018)

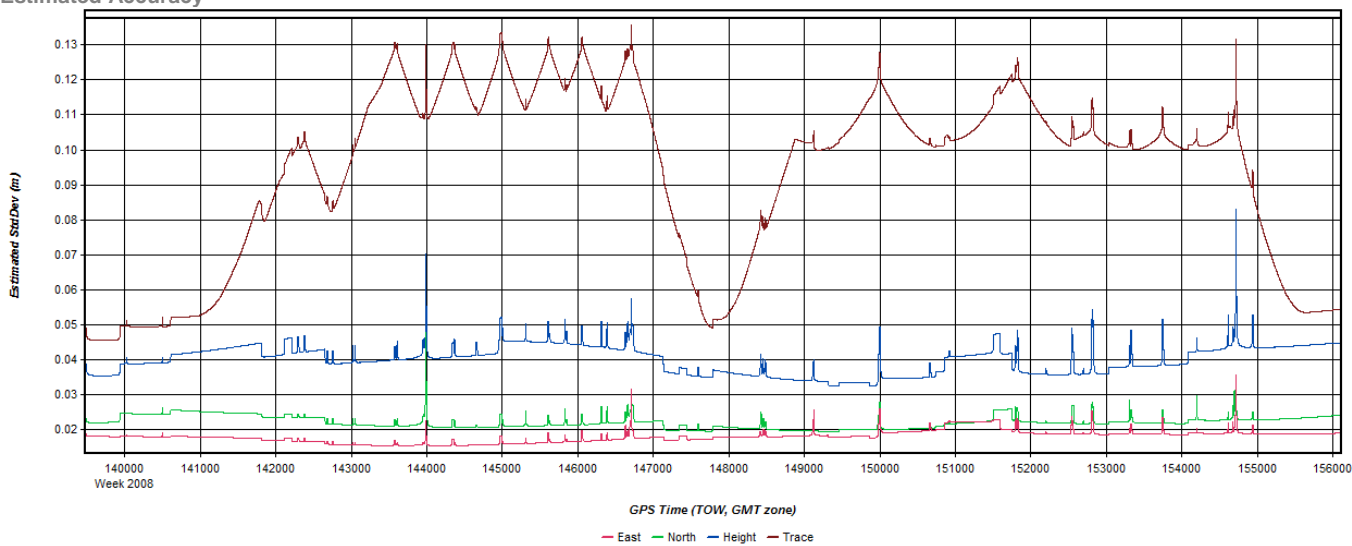
Log: 180702_165_33780055_42

FUGRO USA Land, Inc.										Riegl Flight Log AC80-50-00-02							
Flight Date		GPS Day	Lift	Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altitude	Humidity @ Alt	Shipping Track
2-Jul-18		18-183	42	N97HC		KRAP	CCNS 5	-6	2400	130		110	2	0.440	29.87	29.86	64
Mission ID (yyymmdd_Sen_Job_Lift)				Aircraft		Airport ID	FMS	UTC	AMT (ft)	Speed	FOV	Scan Rate (Hz)	MTA	km/WPT	Altitude	Humidity @ Alt	Shipping Track
180702_165_33780055_42				N97HC		KRAP	CCNS 5	-6	2400	130		110	2	0.440	29.87	29.86	64
Pilot #1		Pilot #2		Operator #1				Operator #2									
Stuart Mills				Riley Forsyth													
Base 1 ID	Location			Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data		
				GR3-01	GR3-01	1.8					GR3_070702n		Jonathan Spencer				
Area	Flight #		Wpt		Distance		UTC		Dir	Altitude (GPS)	Speed (knots)	Scan Rate	Comments and Conditions			SVs	PDOP
	FGI	Client	From	To	Begin	End	Start	End									
							17:13:15						s turn			18	1.0
reflights	15		9	1	3.5	0	17:19:27	17:20:46	S	5355	118		cross tie line			19	1.0
	10		1	108	0	47.1	17:25:58	17:38:38	E	5124	123					21	0.9
	9		108	1	47.1	0	17:40:36	17:53:31	W	5105	120					19	0.9
	8		1	108	0	47.1	17:55:50	18:08:28	E	5060	118					17	1.0
	8		108	20	47.1	8.4	18:11:20	18:21:42	W	5054	110		calibration line			18	1.0
	7		43	1	18.5	0	18:28:11	18:33:47	W	5494	121					18	1.1
	6		1	43	0	18.5	18:36:01	18:41:04	E	5291	125					18	1.1
	5		43	1	18.5	0	18:43:17	18:48:33	W	5377	117					17	1.2
	4		1	43	0	18.5	18:51:05	18:56:16	E	5268	122					16	1.3
							18:56:26						s turn			14	1.2
							19:16:00	19:21:00					ground static at KRAP			16	1.1

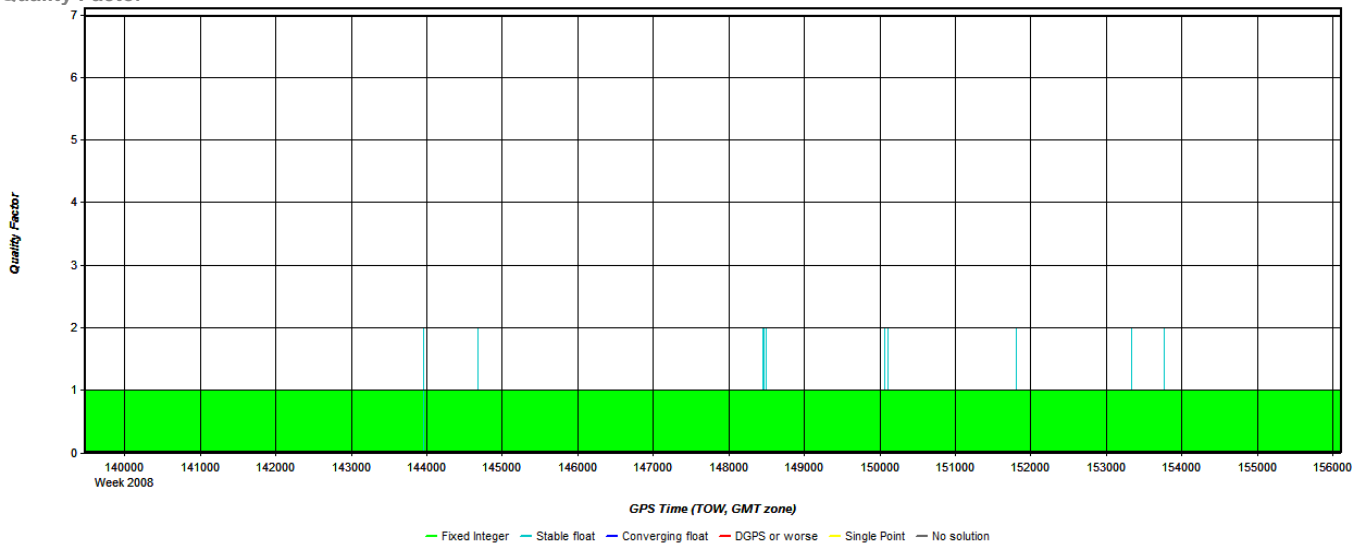
Trajectory and GPS Plots:



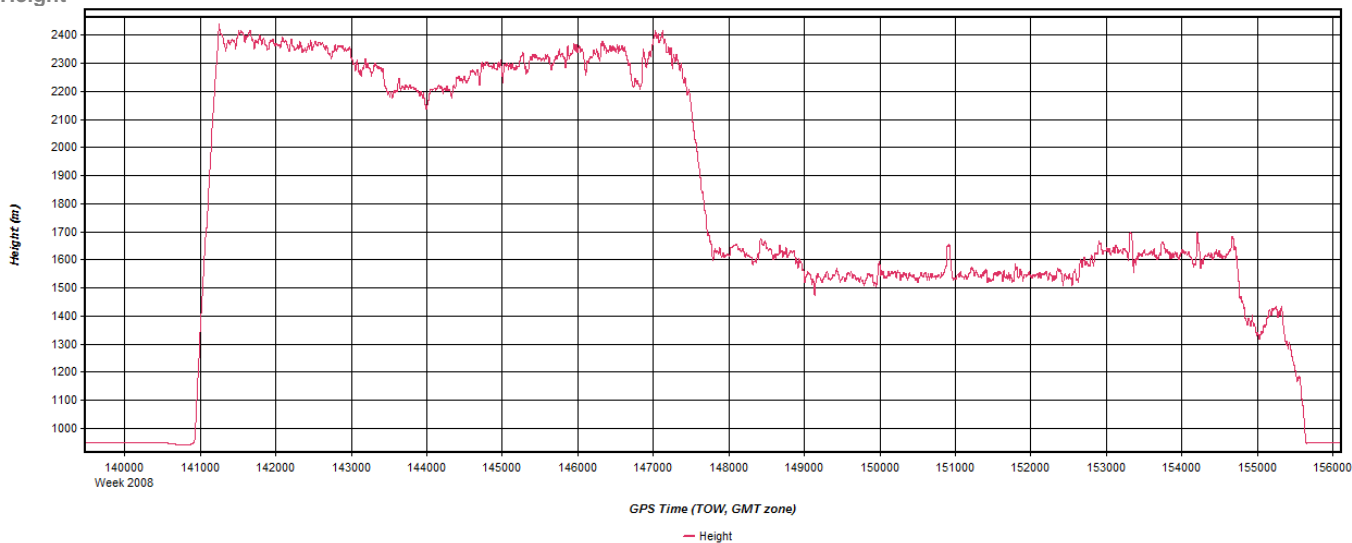
Estimated Accuracy



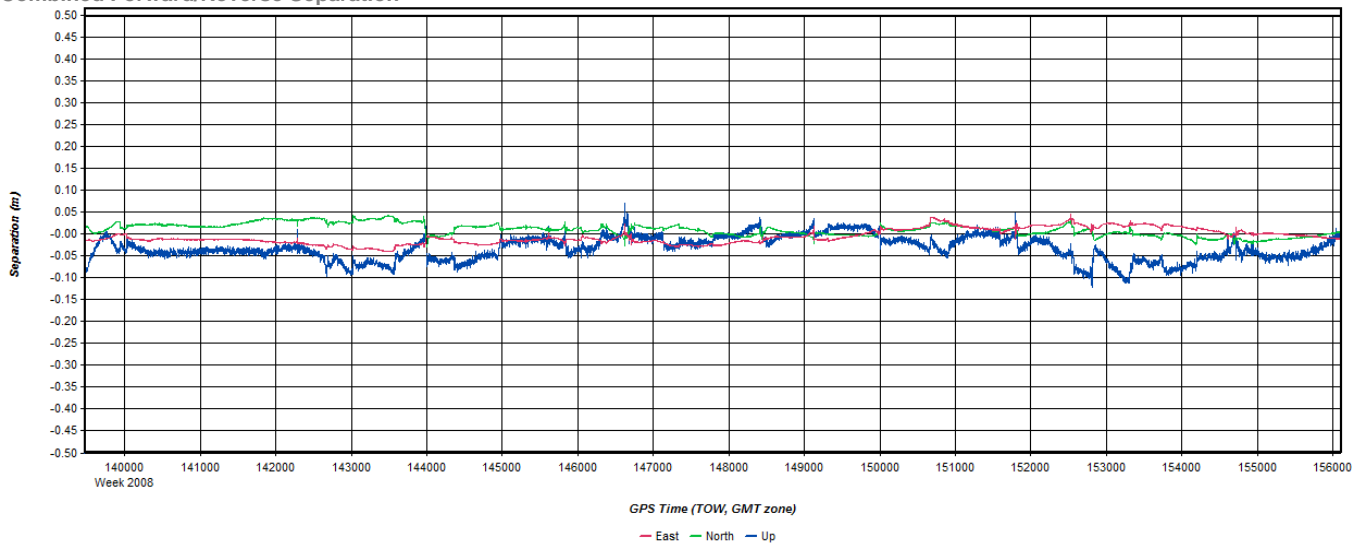
Quality Factor



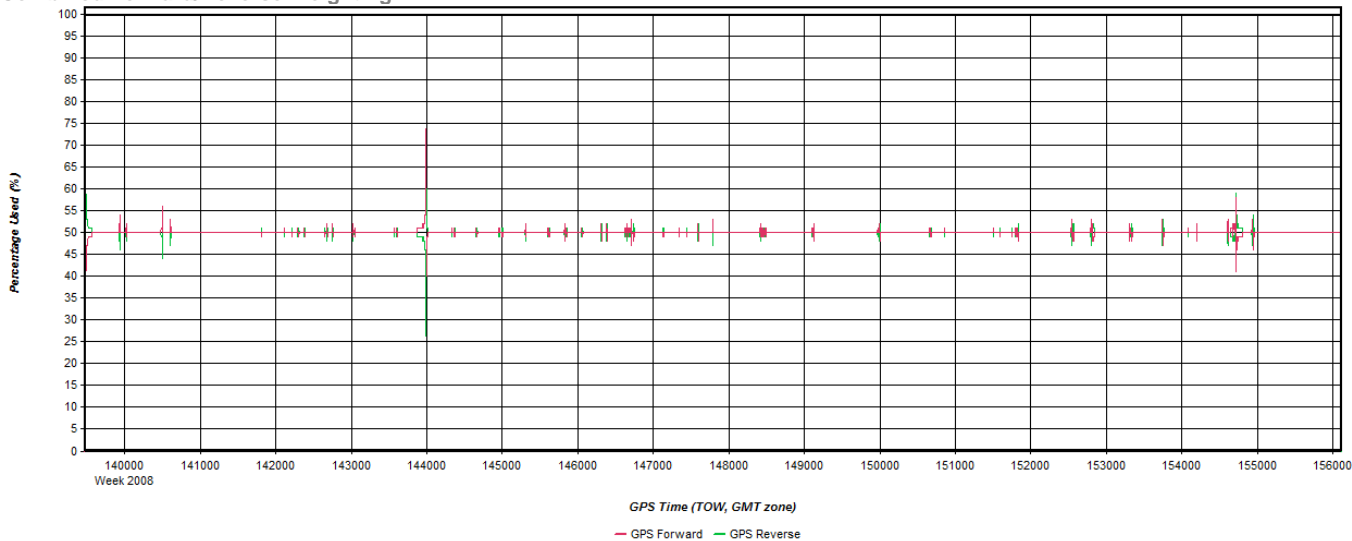
Height



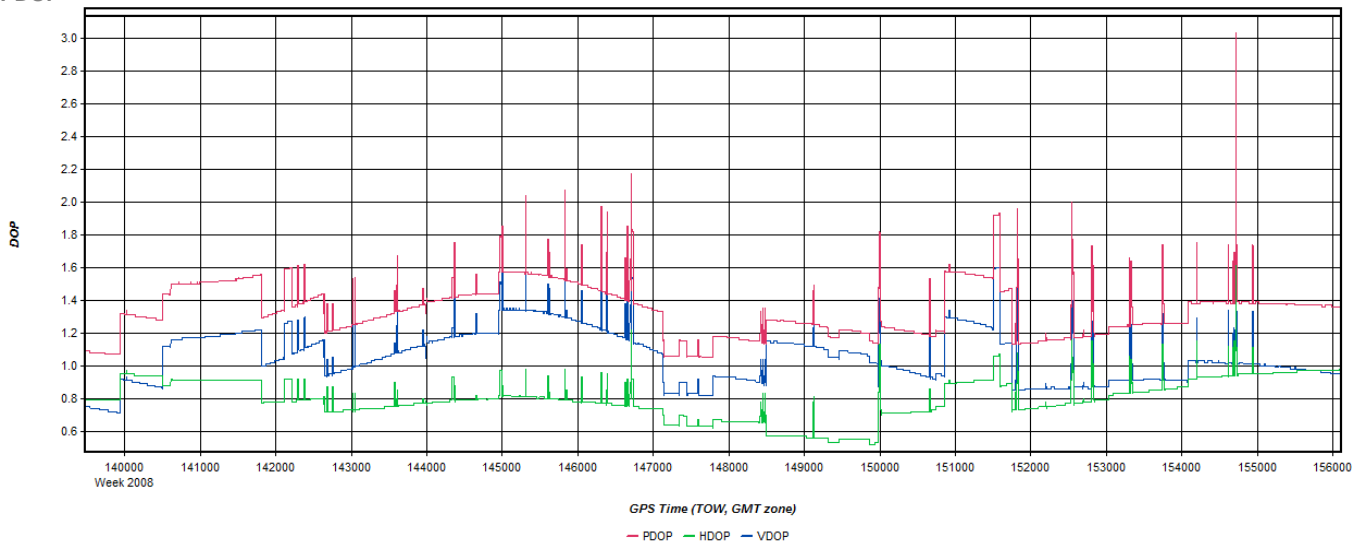
Combined Forward/Reverse Separation



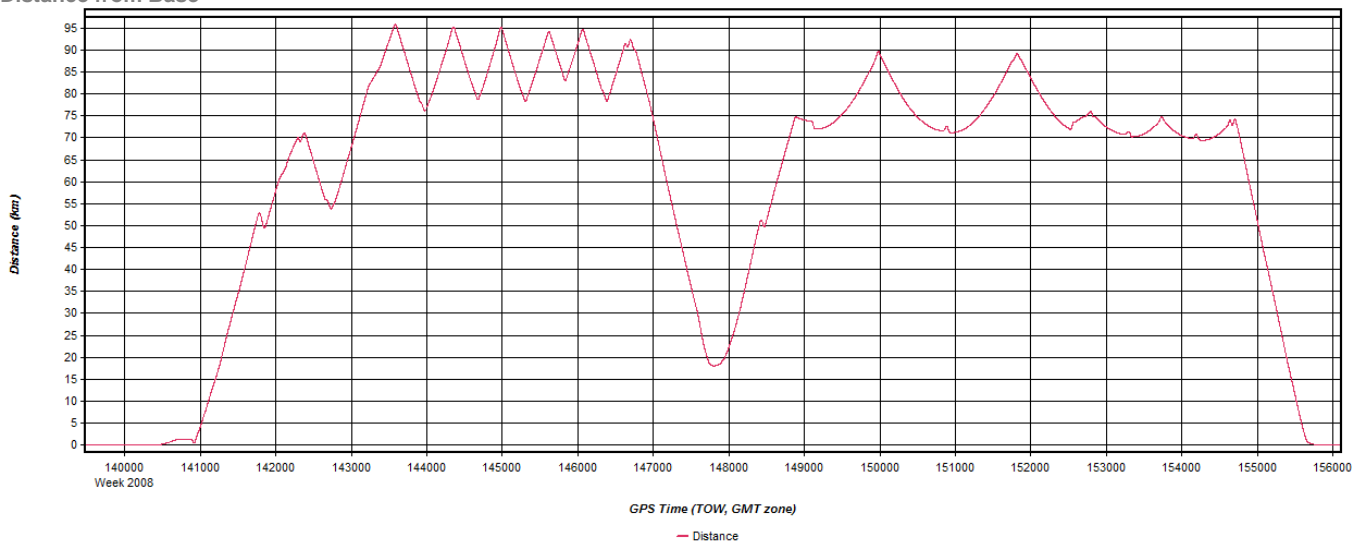
Combined Forward/Reverse Weighting



PDOP

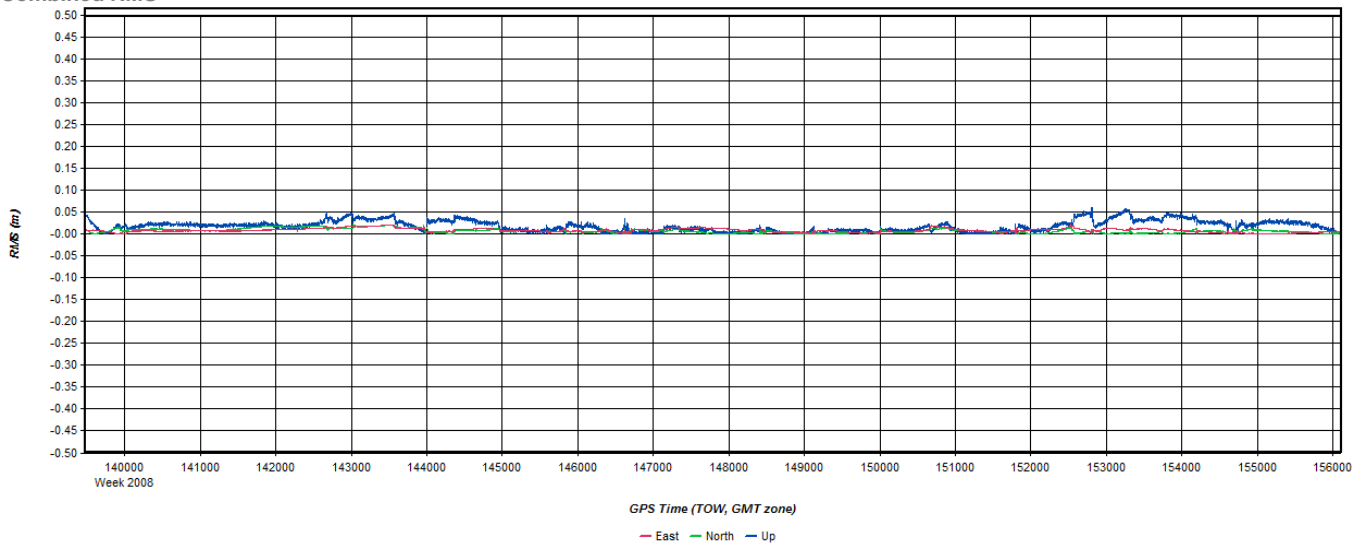


Distance from Base

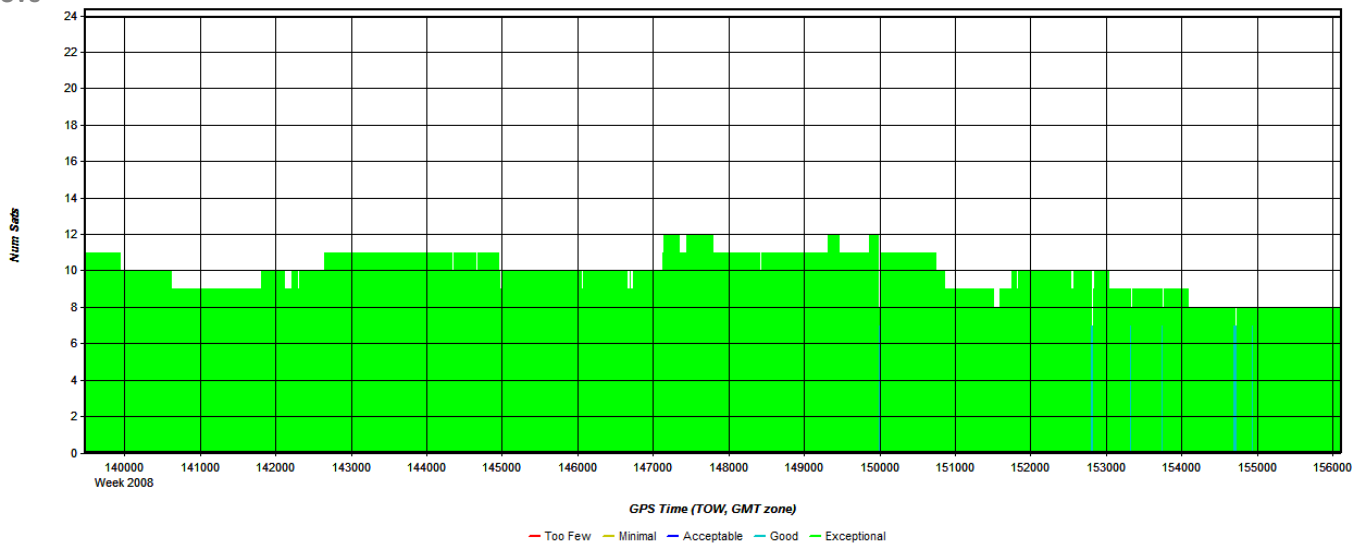




Combined RMS



SVs



Acquisition and Processing details ----- (November 14, 2018)

USGS
COLLECTION REPORT



Log: 181114_130_33780055_20

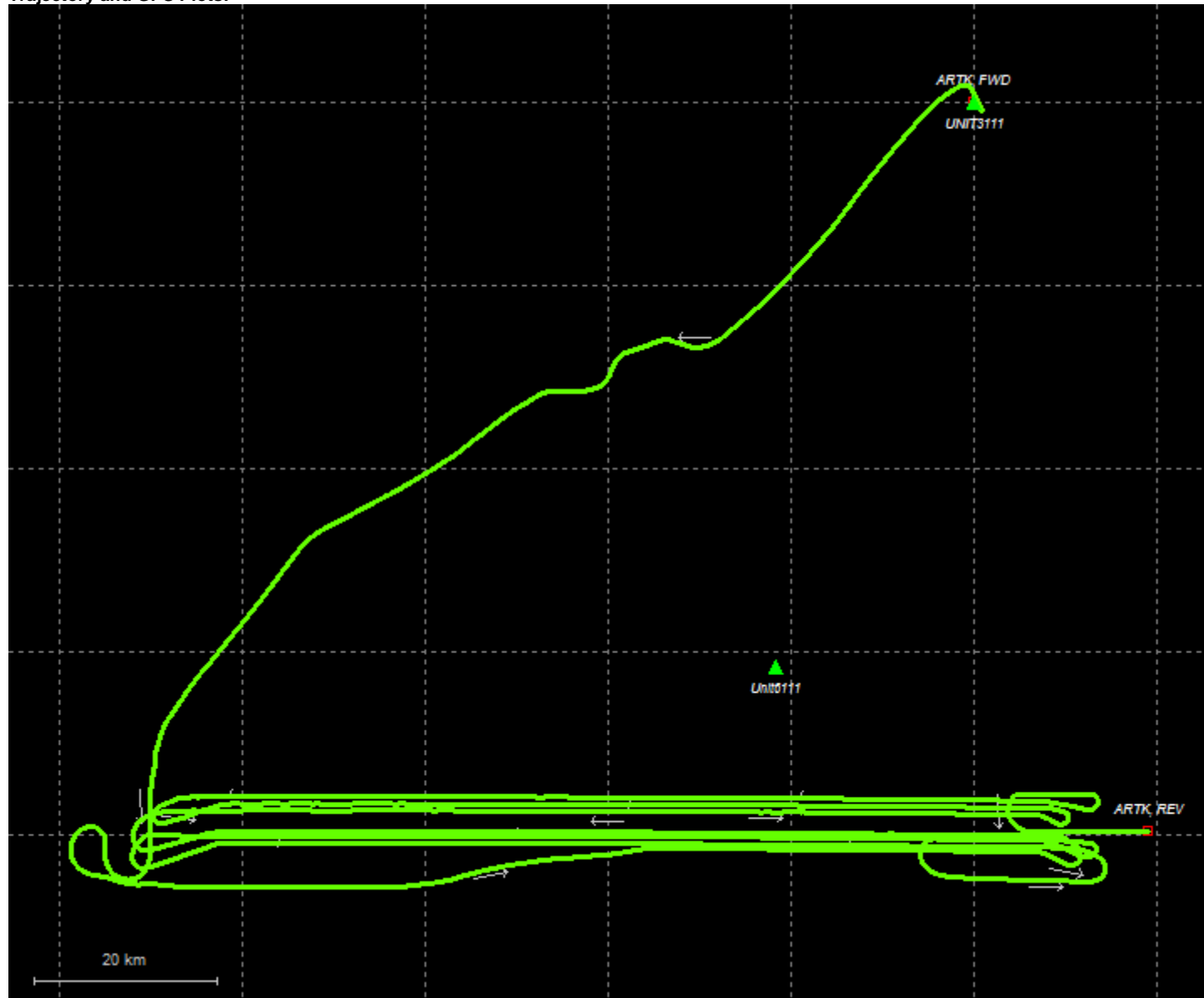
Menu		18.165 Lift Begin			Lift End			Fit	Fit	Hobbs	Activity
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs	
1	KRAP	15:11	1298.5	KRAP	19:50	1303.0	4:39	4.75	4.5	0900-Production	
2											
3											

		Fugro USA Land, Inc.											
Flight Log AC80-44-00-02													

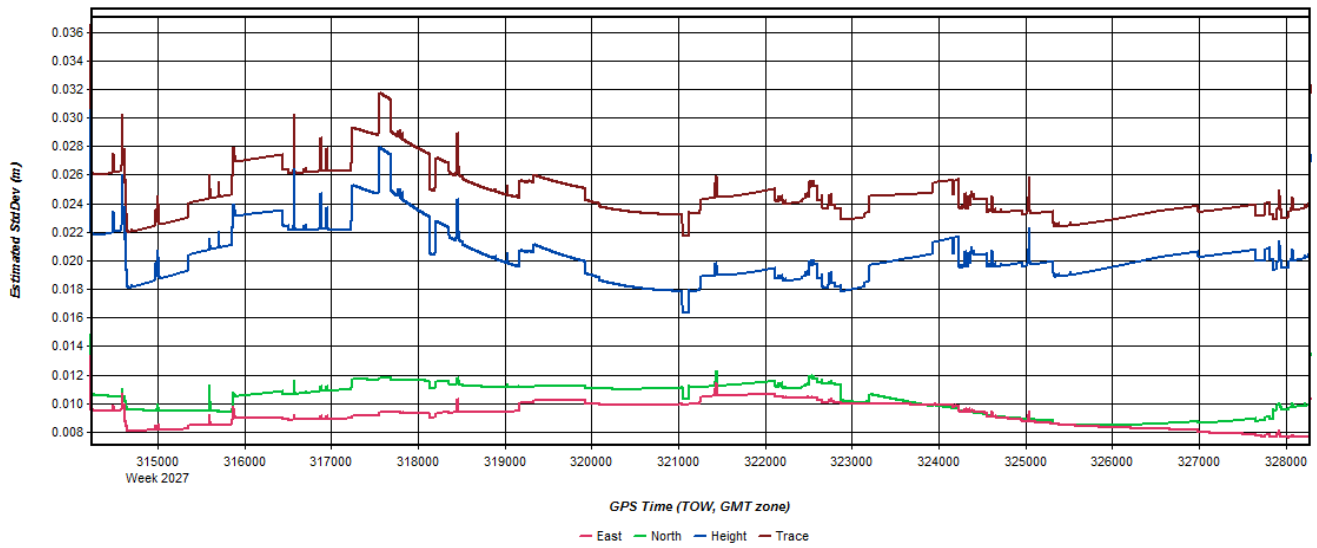
FGI Job #	Project Name			System	Unit	IMU	PA	SW1	SW2-Gain	Aper	AutoScan	Ground Temp °C	Min Range Gate	Data Logger Drive
33780055	USGS SD utm13			ALS80	130	uIRS	4		255	60°	Yes		7319	LG 102
Flight Date	GPS Day	Lift		Sun°	Solar Times (UTC)		Laser Power	Pattern	Flying Temp °C	Max Range Gate	Download Drive			
14-Nov-18	18-318	20		N/A	N/A		100%	Triangle		8825				
Mission ID (yyymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	km/WPT	Altm Setting	Shipping Track		
181114_130_33780055_20	N97HC	KRAP	CCNS 8	-7	8,450	<150	58.0	442K	23	1.549		NS1TB-73		
Pilot #1	Pilot #2	Operator #1		Operator #2		winds289-18knots								
Stuart Mills	Mason Collins	Lee Scadden		N/A										
Base 1 ID	Location	Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data	
FGI 081	KRAP	GR3-3	GR3-3	1.8	181114-00:30		181114-00:30		Unit31114n.tps		Lee Scadden		FTP	
Base 2 ID	Location	Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename		Operator		Data	
Base STN	Buffalo Gap													

Area	Flight #		Wpt		Distance		UTC		Fit	Altitude	Speed	Scan	Comments and Conditions	SVs	PDOP
	FGI	Client's	From	To	Begin	End	Start	End							
													5 Minute GRD Static KRAP-Plane N97HC	17	1.3
USGS SD													S-Turn		
ALS13G	60		1	8	17	10.8			E				RF		
	54		36	57	54.2	86.7			E				RF		
	53								W						
	52								E						
	52								W				Calibration Line		
	51								E						
	48								W						
	47								E						
	46								W						
													S-Turn		
													Buffalo Gap Base		
													3 Minute GRD Static KRAP-Planes N97HC		

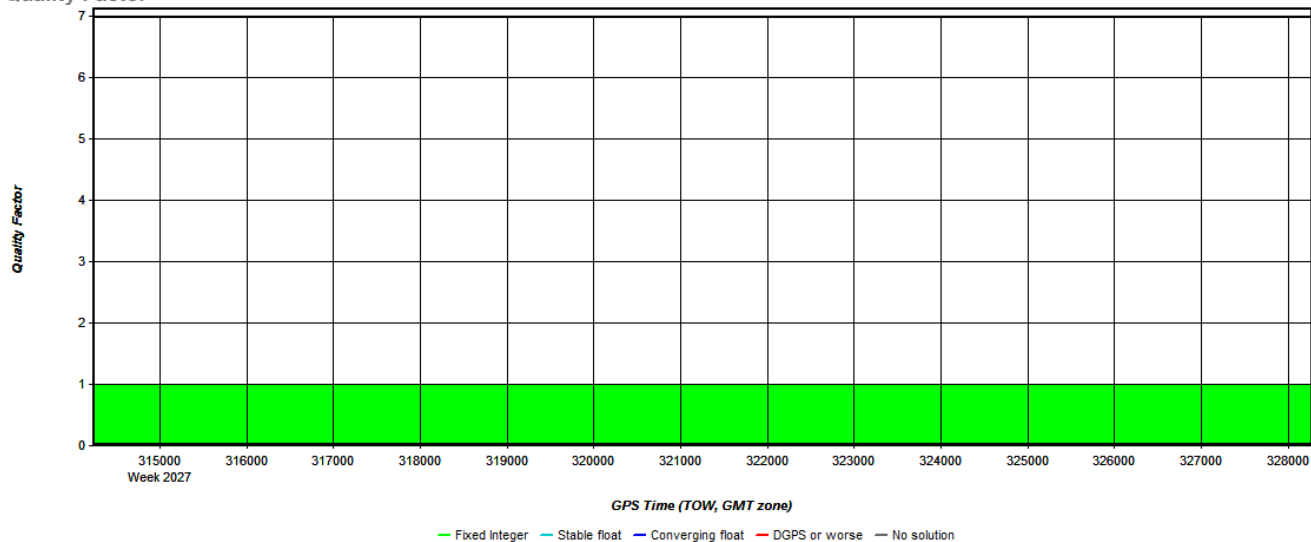
Trajectory and GPS Plots:



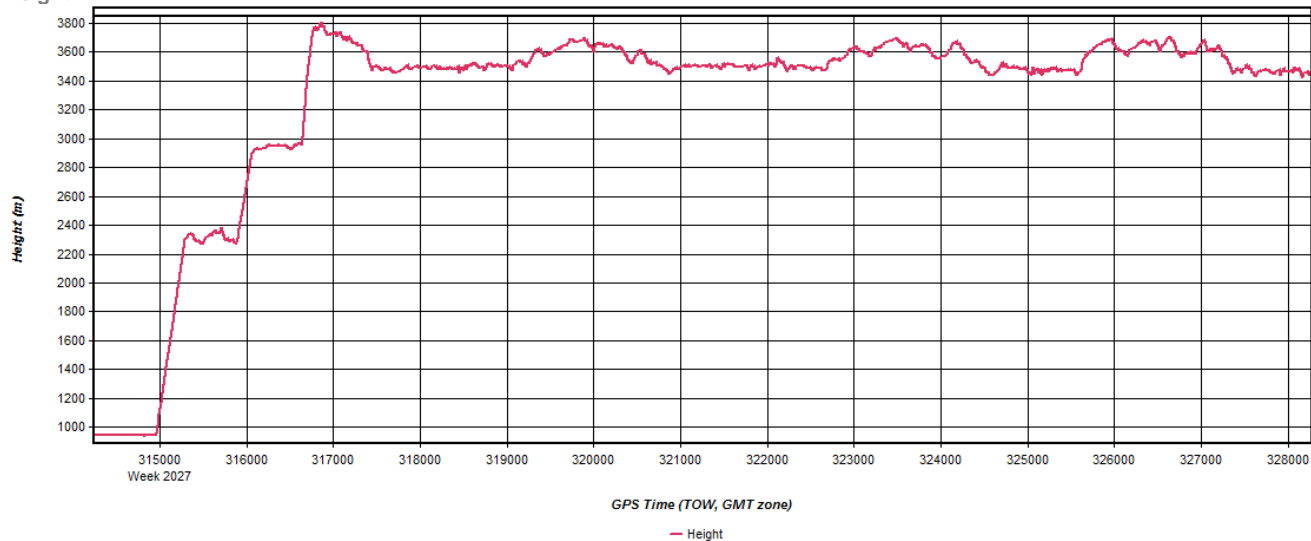
Estimated Accuracy



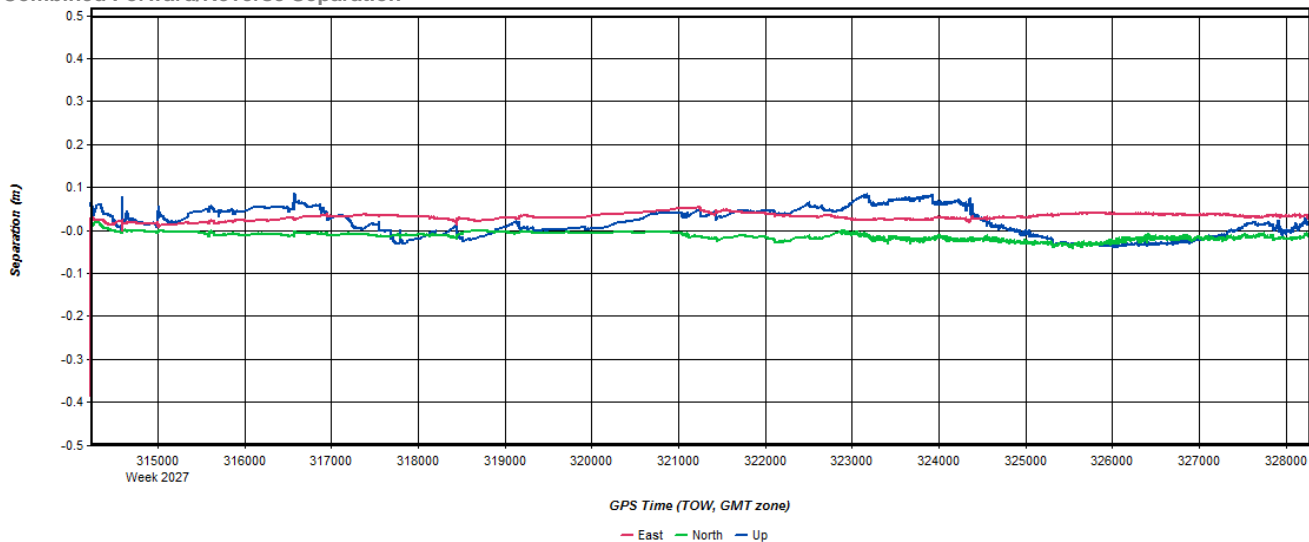
Quality Factor



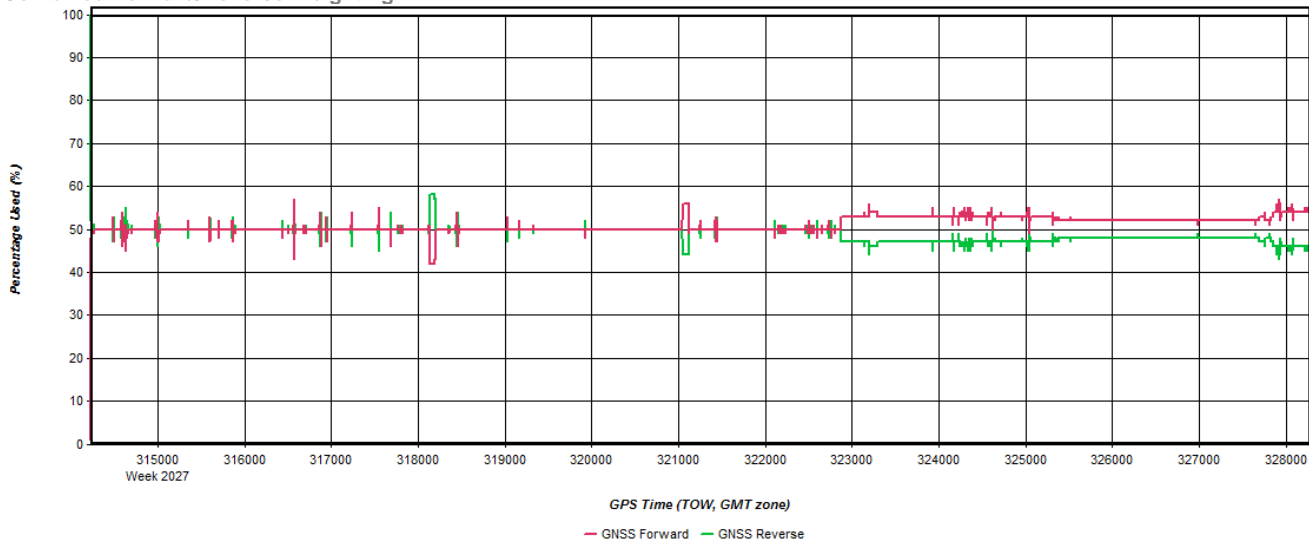
Height



Combined Forward/Reverse Separation

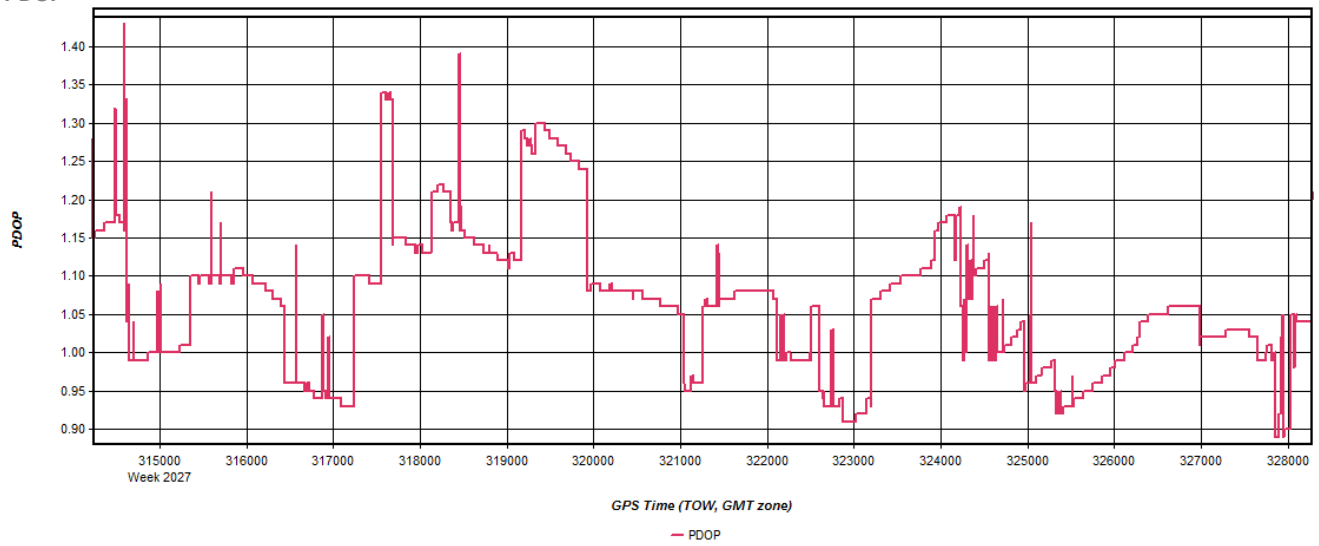


Combined Forward/Reverse Weighting

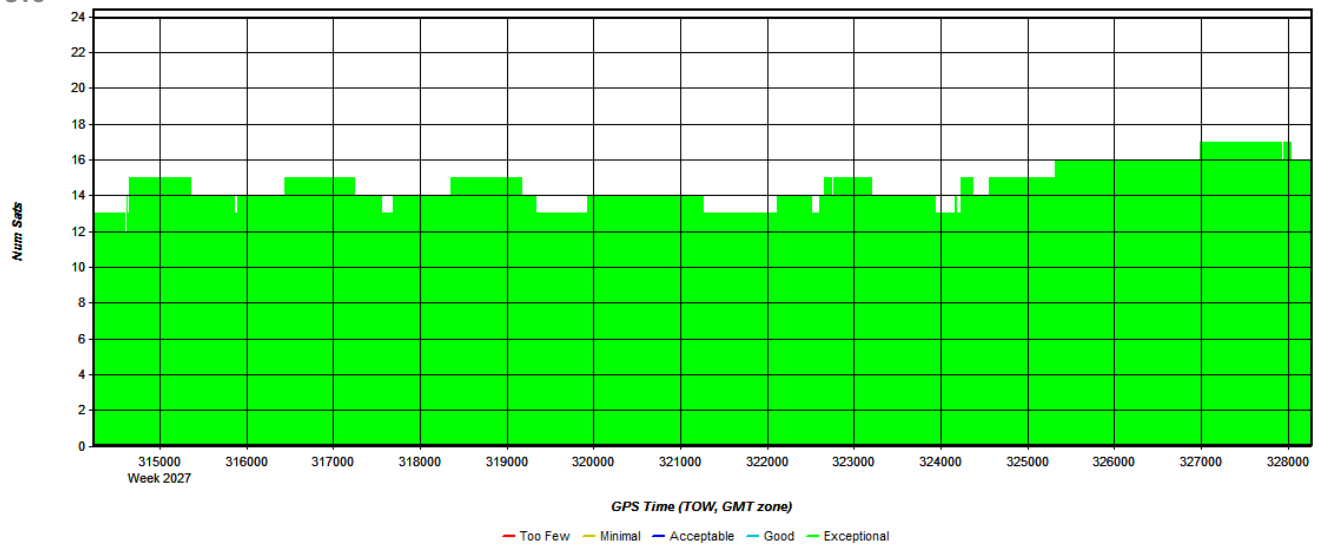


USGS COLLECTION REPORT

PDOP



SVs





Acquisition and Processing details ----- (December 17, 2018)

Log: 181217_130_33780055_23

Menu		18.165 Lift Begin			Lift End			Flt	Flt	Hobbs	Activity	
		Airport	Chocks	Hobbs	Airport	Chocks	Hobbs	Duration	Hrs	Hrs		
		1	KRAP	18:33	1308.4	KRAP	20:26	1309.6	1:53	2.00	1.2	0900-Production
		2										
		3										

Fugro USA Land, Inc. **ALS** Flight Log AC80-44-00-02

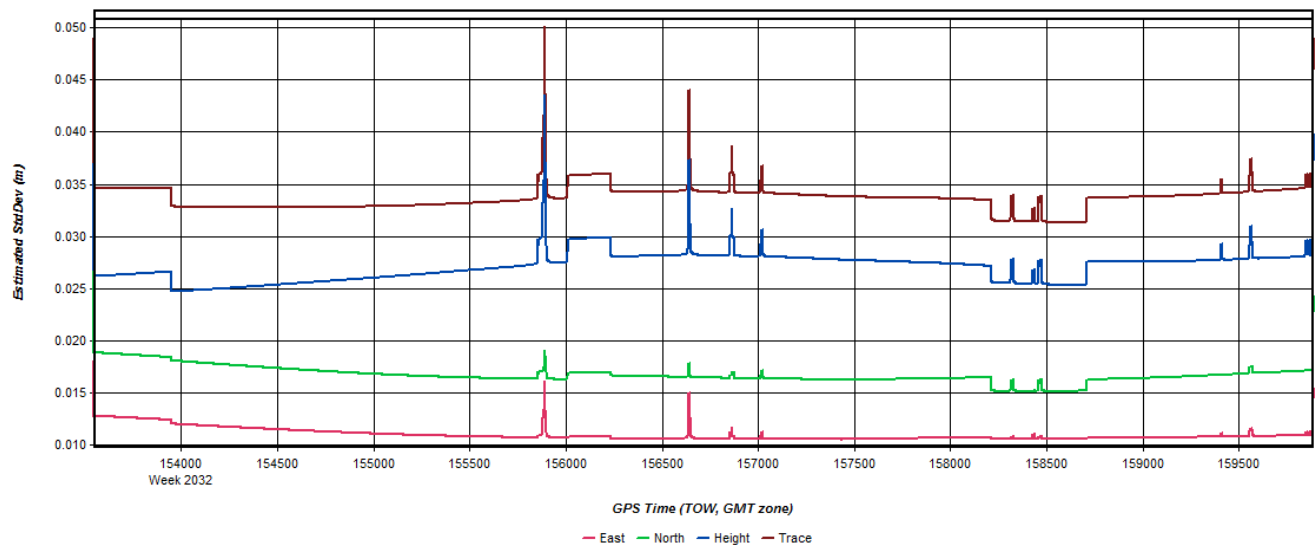
FGI Job #	Project Name		System	Unit	IMU	RA	SW1	SW2-Gain	Aper	AutoScan	Ground Temp °C	Min Range Gate	Data Logger Drive		
04.33780055	SGS FY18 NRCS Lidar utm13 EAST ALS		ALS80	8130		5					9.0 14.0	8020'	MM70-16		
Flight Date	GPS Day	Lift	Sun°		Solar Times (UTC)		Laser Power	Pattern		Flying Temp °C	Max Range Gate	Download Drive			
17-Dec-18	18-351	23	-		-		100%	Triangle		3.0 3.0	9147'	-			
Mission ID (yyymmdd_Sen_Job_Lift)	Aircraft	Airport ID	FMS	UTC	AMT (ft)	Speed	Scan Hz	Pulse Rate	FOV	mi/WPT	AltM Setting	Shipping Track			
181217_8130_33780055_23	N97HC	KRAP	CCNS 8	-7	8,700	150	55.0	534200 HZ		1.590	29.90 29.80	NA			
Pilot #1	Pilot #2	Operator #1		Operator #2											
Ken Davis (Kato)	Randy Green	Chris Acuña		-											
Base 1 ID	Location	Rec ID	Ant ID	ARP (m)	Start Time (UTC)		Stop Time (UTC)		GPS Filename	Operator	Data				
FGI081	KRAP	GR3#1	GR3#1	1.8	17-Dec-18 17:27		17-Dec-18 20:51		Unit11217r	Chris Acuña	FTP				
Area	Flight #	Wpt	Distance	UTC		Flt	Altitude	Speed	Scan	Comments and Conditions		SVs	PDOP		
	FGI	Client's	From	To	Begin	End	Start	End	Dir	(GPS)	(knots)	Rate			
							18:43:25	18:48:25					5 Min GND static alignment at KRAP	19	1.3
							19:17:00	19:19:32					S-Turn in flight alignment	22	1.1
ALS13D	3		37	44	57.2	68.4	19:26:02	19:28:44	83	11342	153		RF wpts 37-44	22	1.0
	3		44	37	68.4	57.2	19:38:53	19:41:57	263	11342	136		RF wpts 44-37	22	1.1
	3		37	44	57.2	68.4	19:45:46	19:48:38	83	11342	142		RF wpts 37-44	22	1.1
							19:55:27	19:57:53	N	11319	145		Crossing line across wp 40	22	1.0
							19:58:04	20:00:21					S-Turn post in flight alignment	22	1.0
							20:19:18	20:24:18					5 Min post GND static alignment at KRAP		

Trajectory and GPS Plots:



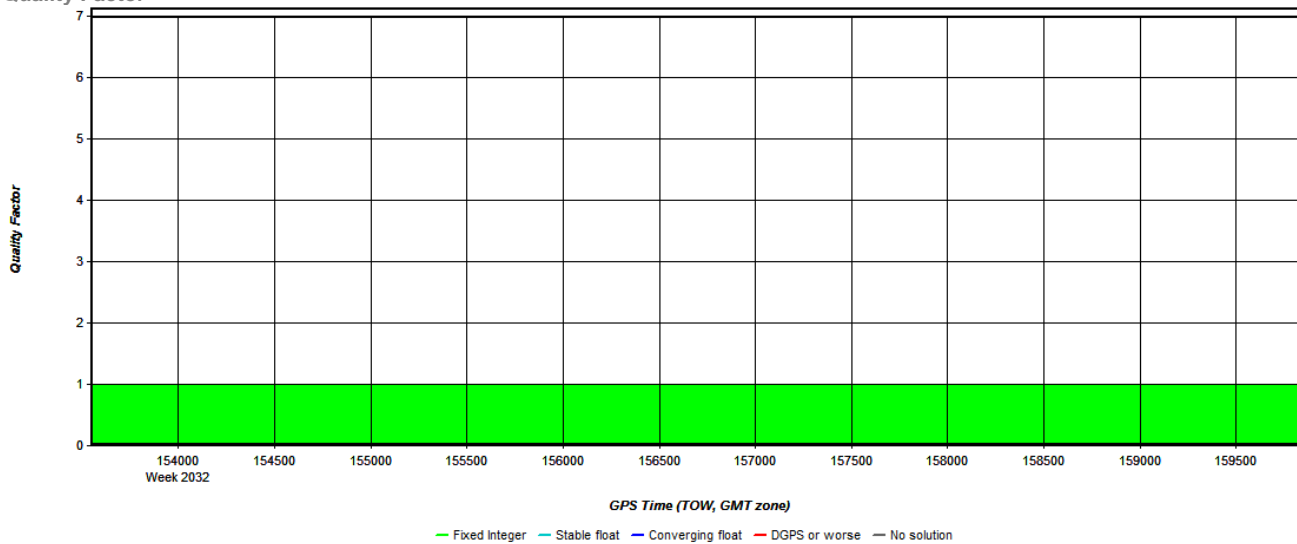
Estimated Accuracy

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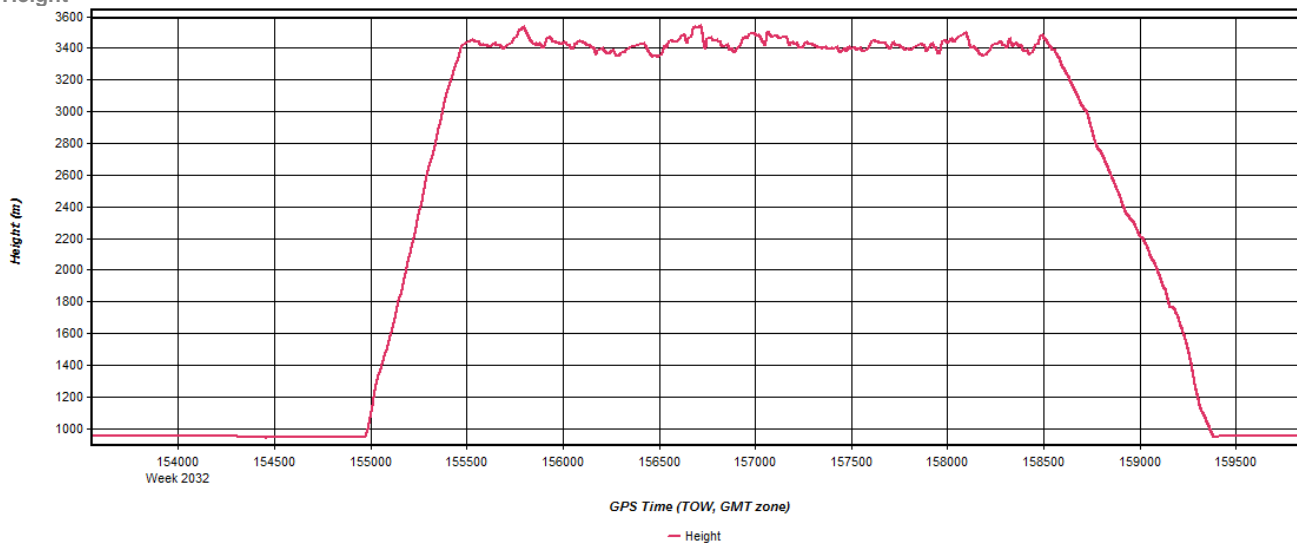




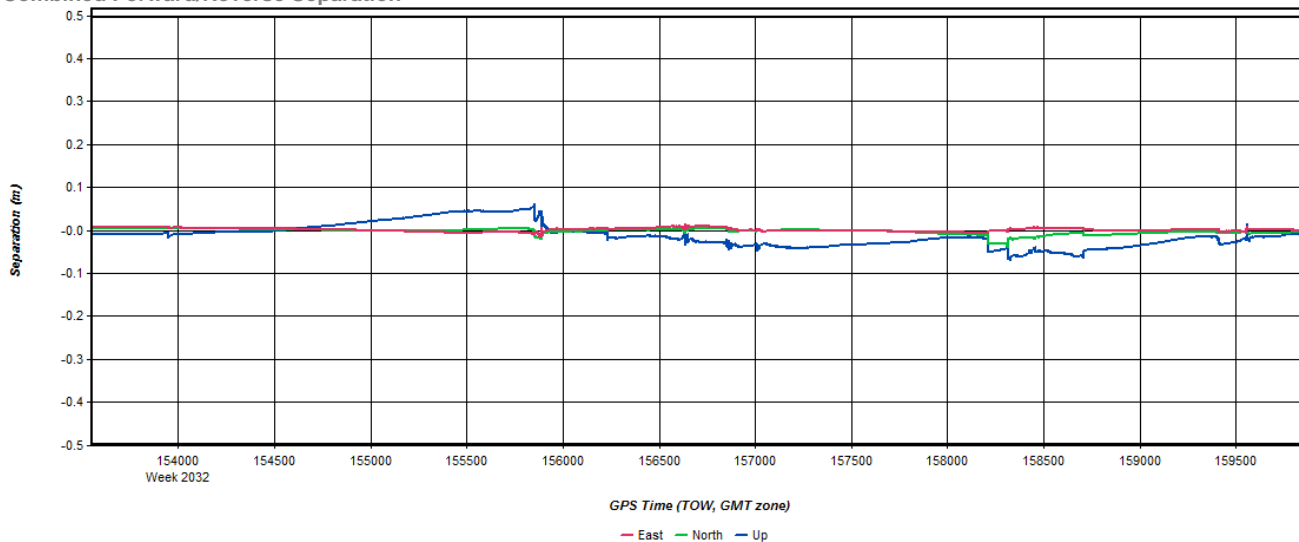
Quality Factor



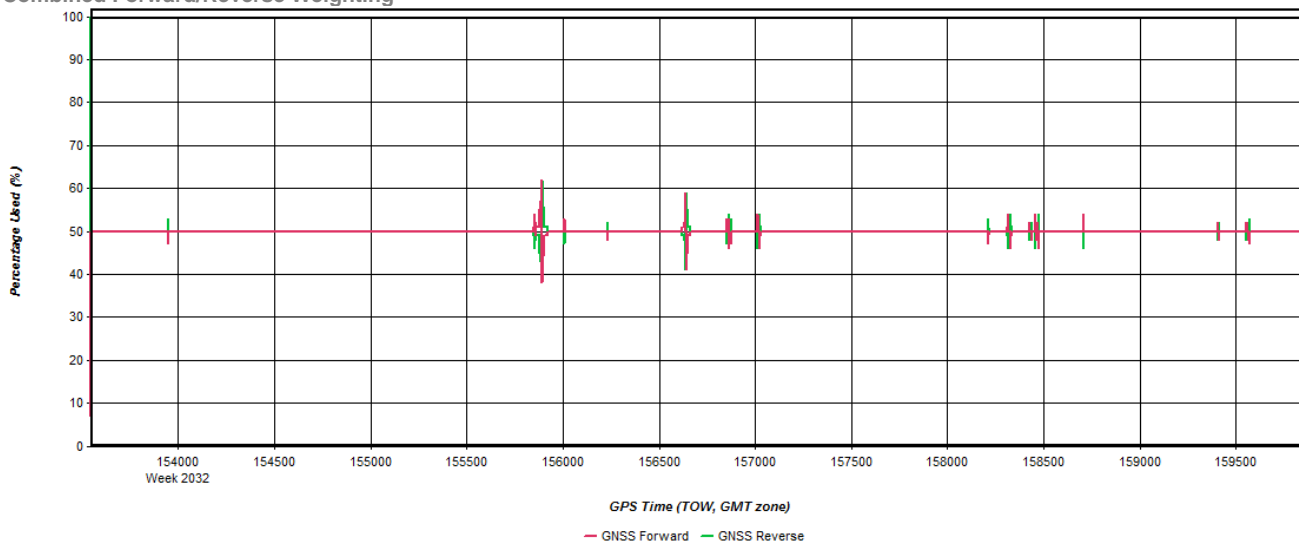
Height



Combined Forward/Reverse Separation

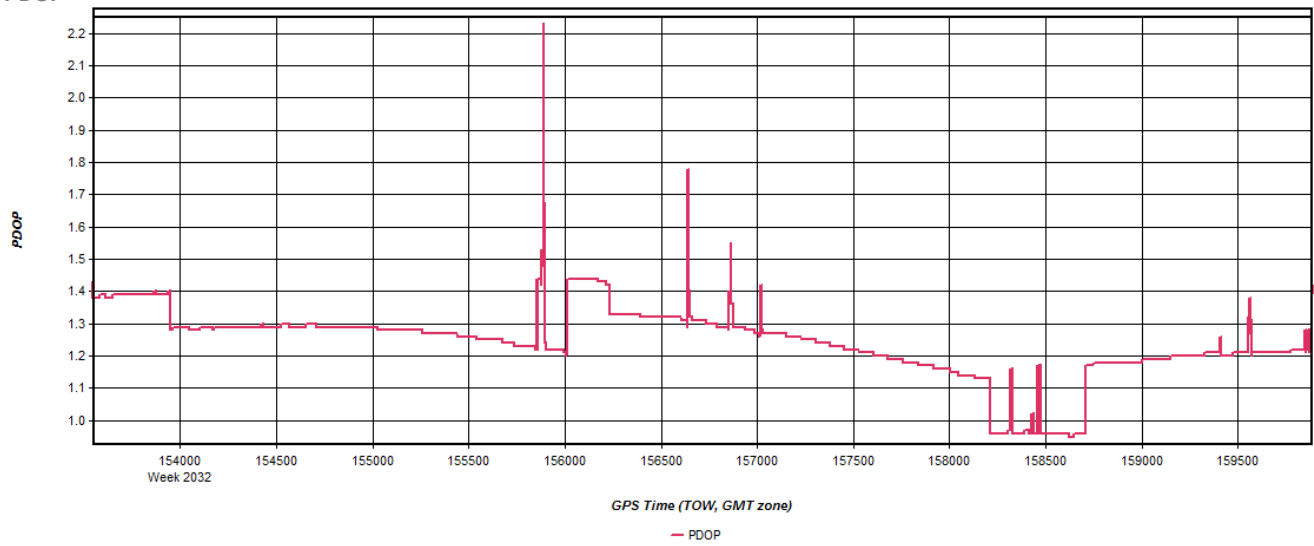


Combined Forward/Reverse Weighting

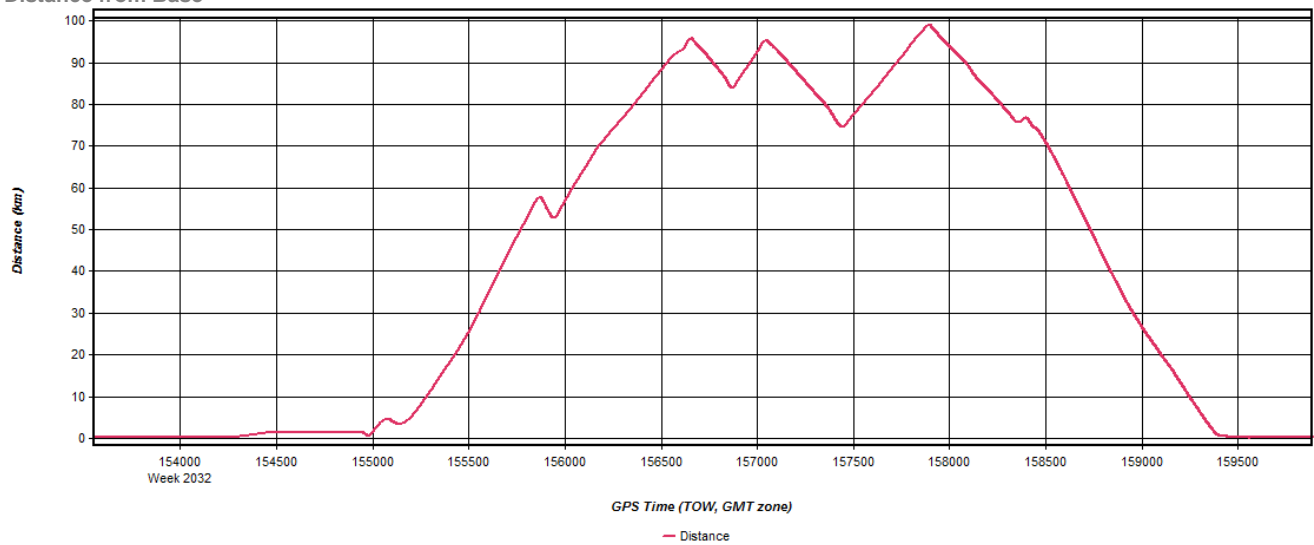


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PDOP



Distance from Base



SVs

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