



## Check reference station coordinates NAM

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## 1 Procedure

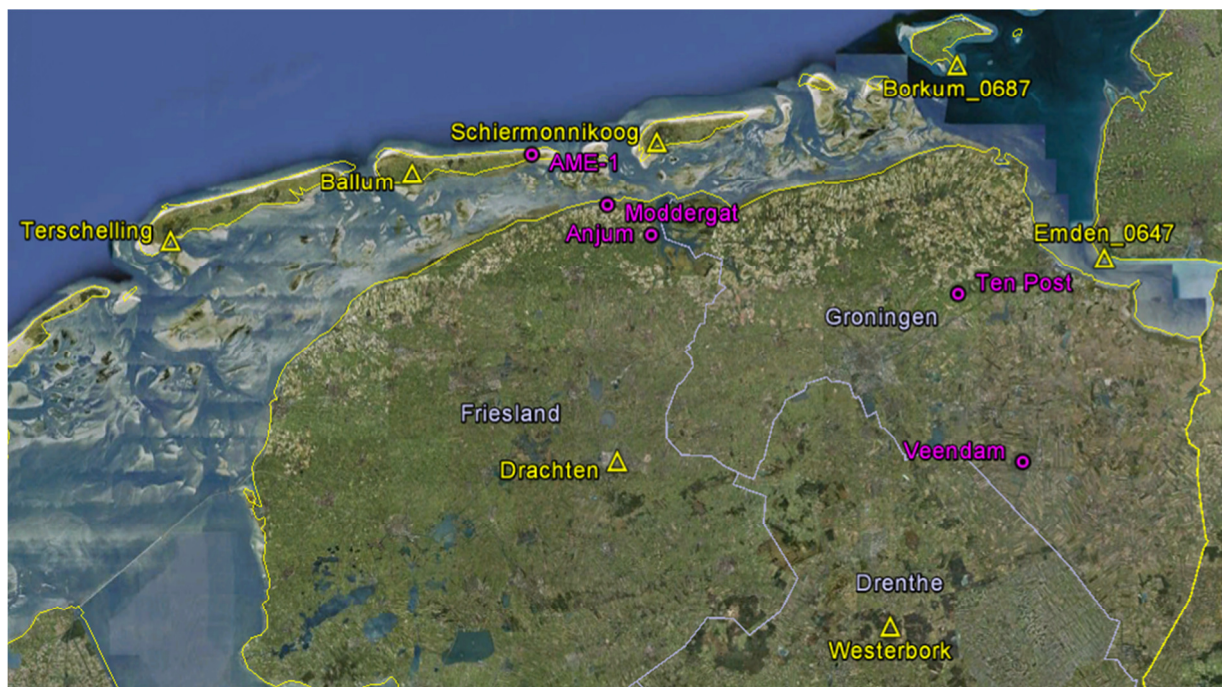
Since 2006, OG-GPS processes GPS data of permanent monitor stations in a network with reference stations on a monthly basis (see Fig. 1 for the actual network). During processing with software package GNSMART, the coordinates of these reference stations are kept fixed (standard deviation of 0.0 mm), whereas the coordinates of the permanent monitor stations get some freedom to move. However, in reality the possibility exists that the positions of the reference stations change as well.

To deal with this problem, the coordinates of all reference station will be recalculated and eventually updated on a yearly basis. OG-GPS follows the advice of Geo++, the software company who developed GNSMART. The advice was formulated as follow:

“To detect the small moving of the gas field stations you should keep the reference station fixed. We suggest to check periodically the used reference station. In case of detected reference station movements, the coordinates of the reference station must be updated.”

The following procedure is performed ones per year:

1. Recalculation of all reference station coordinates; i.e. giving them an a priori standard deviation of 1.0 mm for the horizontal position and 2.0 mm for the height.
2. Change the reference station coordinates for stations with a height deviation of more than 2 mm compared to the existing coordinates.
3. Process the network again with all reference stations fixed to be able to calculate the influence of the new reference station coordinates on the permanent monitor stations.
4. Evaluation of the results.



**Fig. 1. Reference stations (yellow) and permanent monitoring stations (purple)**

## 2 Reference checks

### 2.1 Check 2009

Time series: 17-05-2009 until 27-06-2009  
Duration: 6 weeks  
Reference: coordinates 2006 (see appendix A.1)

The difference between the reference station coordinates of 2006 and the recalculated coordinates is shown in Table 1. Notice that the stations 0687 (Borkum) and drac (Drachten) show a height deviation of more than 2 mm. Drachten has subsided even 6 mm in 3 years.

Station	dX (m)	dY (m)	dZ (m)
0687	0.0072	0.0076	0.0031
ball	-0.0001	-0.0006	-0.0003
drac	-0.0030	0.0027	-0.0061
schi	-0.0018	-0.0016	0.0006
ters	0.0005	-0.0061	0.0002
wsra	-0.0036	0.0021	-0.0011

**Table 1. Difference between current coordinates and refcheck results.**

New reference station coordinates are calculated for Borkum and Drachten, these can be found in appendix A.2 (Reference station coordinates 2009). All data since May 3th 2009 is processed with the new reference station coordinates for Borkum and Drachten.

Table 2 shows the influence of the new reference station coordinates for Borkum and Drachten on the permanent monitoring stations. Notice the extra subsidence of almost 1 mm at Moddergat and Anjum, while for ame1 the result did not change. An explanation for this effect is that Moddergat and Anjum are located somewhat closer to reference station Drachten (see Fig. 1), that subsided 6 mm relative to most other reference stations. Also the stable station of Westerbork may have contributed in the minor influences on Moddergat and Anjum.

Station	dx (m)	dy (m)	dH (m)
ame1	0.0002	0.0004	-0.0001
anjm	-0.0002	0.0019	-0.0009
modd	-0.0002	0.0013	-0.0006

**Table 2. Influence of new coordinates for stations 0687 and drac on the permanent monitor stations**



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## 2.2 Check 2010

Time series: 23-05-2010 until 03-07-2010  
Duration: 6 weeks  
Reference: coordinates 2009 (see appendix A.2)

The difference between the reference station coordinates of 2009 and the recalculated coordinates is shown in Table 1. Notice that all height differences are within the maximum tolerance of 2 mm. This makes it unnecessary to change the reference station coordinates. All stations will maintain the coordinates of 2009, see appendix A.3.

Station	dx (m)	dy (m)	dH (m)
0687	0.0004	0.0012	-0.0018
ball	0.0006	0.0019	-0.0011
drac	0.0006	0.0031	0.0012
schl	-0.0007	-0.0007	-0.0002
ters	0.0028	-0.0061	-0.0015
wsra	-0.0037	0.0052	0.0004

**Table 1. Difference between current coordinates and refcheck results.**



### 2.3 Check 2011

Time series: 17-04-2011 until 28-05-2011  
 Duration: 6 weeks  
 Reference: coordinates 2010 (see appendix A.3)

The differences between the reference station coordinates of 2009 and the recalculated coordinates are shown in Table 1. Notice that the stations 0687 (Borkum) and ters (Terschelling) show a height deviation of more than 2 mm. The deviation of station Borkum is most likely related to an antenna replacement on October 20<sup>th</sup> 2010, in spite of the fact that a new individual antenna calibration file has been used for processing since that time.

Station	dx (m)	dy (m)	dH (m)
0687	0.0006	0.0006	-0.0037
ball	0.0013	0.0019	0.0012
drac	0.0000	0.0050	-0.0004
schi	-0.0009	-0.0013	0.0010
ters	0.0033	-0.0071	0.0024
wsra	-0.0039	0.0058	-0.0011

**Table 1. Difference between current coordinates and refcheck results.**

The recalculated coordinates are applied for reference stations Borkum and Terschelling, these coordinates can be found in appendix A.4 (Reference station coordinates 2011).

The time series is processed again to calculate the influence of the new reference station coordinates for Borkum and Terschelling on the permanent monitoring stations. Table 2 shows the results. Notice that station Anjum (anjm), which is located closest to Borkum, gets the largest correction.

Station	dx (m)	dy (m)	dH (m)
ame1	0.0002	-0.0003	-0.0003
anjm	0.0000	0.0000	-0.0006
modd	0.0002	0.0000	-0.0004

**Table 2. Influence of new coordinates for stations 0687 and ters on the permanent monitor stations**

All data since May 1<sup>st</sup> 2011 has been processed with the new reference station coordinates for Borkum and Terschelling.

## 2.4 Check 2012

Time series: 22-04-2012 until 02-06-2012  
Duration: 6 weeks  
Reference: coordinates 2011 (see appendix A.4)

06-GPS has been asked by NAM to expand the 'refcheck' with stations Veendam (veen) and Emden (0647). These stations, as well as station Drachten (drac), are likely to be within the influence zone of gas and/or salt abstraction. These stations will also be used for comparison with InSAR data. Therefore the coordinates of these three stations are calculated again within the network for an up-to-date accurate solution. During this calculation, coordinates of all other stations were kept fixed. Comparison with results of 2011 gives the following differences:

Station	dx (m)	dy (m)	dH (m)
0647	-0.0024	0.0012	-0.0003
drac	0.0008	0.0020	-0.0009
veen	-0.0037	0.0042	-0.0034

**Table 1. Difference between 2011 and 2012.**

The new coordinates of these three stations (see appendix A.5) are used for the actual 'refcheck'. In this calculation, all stations get some freedom to settle. The results should reveal if any other station have been moved over the last year. The results are shown in Table 2.

Station	dx (m)	dy (m)	dH (m)
0647	-0.0007	-0.0003	-0.0008
0687	0.0009	-0.0012	-0.0010
ball	0.0021	0.0015	0.0000
drac	0.0002	0.0013	-0.0003
schi	0.0006	-0.0025	-0.0016
ters	0.0015	-0.0018	0.0003
veen	-0.0011	0.0015	-0.0003
wsra	-0.0030	0.0053	0.0010

**Table 2. Difference between current coordinates and refcheck results.**

The refcheck did not reveal deviations more than two millimeter in height, meaning that no other coordinate updates were necessary. The time series is processed again to calculate the influence of the new coordinates of station Drachten (Table 1) on the permanent monitor stations. This influence appears to be minimal, see Table 3. All data since May 6<sup>th</sup> 2012 has been processed with new coordinates for station Drachten.

Station	dx (m)	dy (m)	dH (m)
ame1	0.0000	0.0000	0.0000
anjm	0.0000	0.0003	-0.0003
modd	0.0002	0.0003	-0.0002

**Table 3. Influence of new coordinates for station Drachten on the permanent monitor stations**



## 2.5 Check 2013

Time series: 21-04-2013 until 25-05-2012  
 Duration: 6 weeks  
 Reference: coordinates 2012 (see appendix A.4)

Since March 19<sup>th</sup> 2013, monitor station 'tenp' (Ten Post) has been added to the network. In addition, also station 'veen' (Veendam) has been considered to be a monitor station, because it subsides about 3 mm per year. Reference station '0647' (Emden) is permanently used within the network since March 19<sup>th</sup> 2013.

Reference stations '0647' (Emden) and 'drac' (Drachten) are located at the edge of a gas field. Therefore the coordinates of these two stations are calculated again within the network for an up-to-date accurate solution. During this calculation, coordinates of all other reference stations were kept fixed. Comparison with results of 2012 gives the following differences:

Station	dx (m)	dy (m)	dH (m)
0647	-0.0043	0.0009	0.0005
drac	-0.0010	0.0034	0.0004

**Table 1. Difference between 2012 and 2013.**

Notice that the horizontal position has been changed a few millimeters, whereas the height didn't change significantly. Therefore only new xy-coordinates for these two stations (see appendix A.6) are applied in the actual 'refcheck'. In this calculation, all stations get some freedom to settle. The results should reveal if any other station has been moved over the last year. The results are shown in Table 2.

Station	dx (m)	dy (m)	dH (m)
0647	-0.0009	-0.0010	0.0000
0687	-0.0009	0.0000	-0.0013
ball	0.0019	0.0031	0.0020
drac	0.0004	0.0009	0.0004
schi	-0.0017	-0.0022	-0.0011
ters	0.0023	-0.0006	0.0003
wsra	-0.0009	0.0009	-0.0004

**Table 2. Differences between current coordinates and refcheck results.**

The refcheck did not reveal deviations more than two millimeters in height, meaning that all stations maintain the height of 2012.





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## A.1 Reference station coordinates 2006

Transformation to RD/NAP based on RDNAPTRANS2004  
Date: 2006

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
0687	SAPOS	fixed	2006	53	33	49.15550	6	44	50.78800	54.4070	0.0540	54.4610	245130.1140	620587.9950	14.2226	0.0540	14.2766	200110	LEIAT504GG
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.3850	606186.3570	13.7208	0.1010	13.8218	2170556	TPSCR3_GGD CONE
drac	06-GPS	fixed	2006	53	6	31.75441	6	4	58.04678	56.3542	0.1470	56.5012	201580.5900	569339.0570	15.0405	0.1470	15.1875	2170593	TPSCR3_GGD CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.0960	610405.7140	10.3550	0.1480	10.5030	2170643	TPSCR3_GGD CONE
ters	AGRS	fixed	2006	53	21	45.84903	5	13	9.78826	56.1008	0.0000	56.1008	143827.2360	597385.4980	14.6893	0.0000	14.6893	220193243	trm29659.00
wsra	AGRS	fixed	2006	52	54	52.58929	6	36	16.20650	82.2751	0.3890	82.6641	236880.5080	548192.3070	40.7251	0.3890	41.1141	273	AOAD/M_T

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
ame1	NAM	mobile	27-6-2009	53	27	51.94272	5	55	16.80630	47.9925	0.1480	48.1405	190474.9760	608822.4760	7.3985	0.1480	7.5465	2170510	TPSCR3_GGD CONE
anjm	NAM	mobile	27-6-2009	53	22	15.04173	6	9	8.59146	45.2720	0.0000	45.2720	205931.1420	598546.0390	4.6457	0.0000	4.6457	2170642	TPSCR3_GGD CONE
modd	NAM	mobile	27-6-2009	53	24	19.27159	6	4	2.98542	47.4165	0.1470	47.5635	200244.5590	602329.7940	6.8040	0.1470	6.9510	2170639	TPSCR3_GGD CONE



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## A.2 Reference station coordinates 2009

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Date: 27-6-2009

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
0687	SAPOS	fixed	27-6-2009	53	33	49.15574	6	44	50.78840	54.4101	0.0540	54.4641	245130.1210	620588.0030	14.2257	0.0540	14.2797	200110	LEIAT504GG
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.3850	606186.3570	13.7208	0.1010	13.8218	2170556	TPSCR3_GGD CONE
drac	06-GPS	fixed	27-6-2009	53	6	31.75455	6	4	58.04662	56.3480	0.1470	56.4950	201580.5870	569339.0610	15.0343	0.1470	15.1813	2170593	TPSCR3_GGD CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.0960	610405.7140	10.3550	0.1480	10.5030	2170643	TPSCR3_GGD CONE
ters	AGRS	fixed	2006	53	21	45.84903	5	13	9.78826	56.1008	0.0000	56.1008	143827.2360	597385.4980	14.6893	0.0000	14.6893	220193243	trm29659.00
wsra	AGRS	fixed	2006	52	54	52.58929	6	36	16.20650	82.2751	0.3890	82.6641	236880.5080	548192.3070	40.7251	0.3890	41.1141	273	AOAD/M_T

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
ame1	NAM	mobile	27-6-2009	53	27	51.94273	5	55	16.80631	47.9924	0.1480	48.1404	190474.9760	608822.4760	7.3984	0.1480	7.5464	2170510	TPSCR3_GGD CONE
anjm	NAM	mobile	27-6-2009	53	22	15.04179	6	9	8.59145	45.2711	0.0000	45.2711	205931.1410	598546.0410	4.6448	0.0000	4.6448	2170642	TPSCR3_GGD CONE
modd	NAM	mobile	27-6-2009	53	24	19.27163	6	4	2.98541	47.4159	0.1470	47.5629	200244.5590	602329.7960	6.8034	0.1470	6.9504	2170639	TPSCR3_GGD CONE



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### A.3 Reference station coordinates 2010

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Date: 3-7-2010

Station	owner	status	Date	N ETRS89 (° '' ")			E ETRS89 (° '' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
0647	SAPOS	fixed	3-7-2010	53	20	14.76816	7	1	38.98468	56.9653	0.0540	57.0193	264259.0517	595802.0454	16.4691	0.0540	16.5231	200082	LEIAT504GG
0687	SAPOS	fixed	27-6-2009	53	33	49.15574	6	44	50.78840	54.4101	0.0540	54.4641	245130.1210	620588.0030	14.2257	0.0540	14.2797	200110	LEIAT504GG
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.3850	606186.3570	13.7208	0.1010	13.8218	2170556	TPSCR3_GGD CONE
drac	06-GPS	fixed	27-6-2009	53	6	31.75455	6	4	58.04662	56.3480	0.1470	56.4950	201580.5870	569339.0610	15.0343	0.1470	15.1813	2170593	TPSCR3_GGD CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.0960	610405.7140	10.3550	0.1480	10.5030	2170643	TPSCR3_GGD CONE
ters	AGRS	fixed	2006	53	21	45.84903	5	13	9.78826	56.1008	0.0000	56.1008	143827.2360	597385.4980	14.6893	0.0000	14.6893	220193243	trm29659.00
veen	06-GPS	fixed	3-7-2010	53	6	15.38181	6	51	54.03593	65.9273	0.1470	66.0743	253969.3935	569622.6727	24.9513	0.1470	25.0983	3830189	TPSCR.G3 TPSH
wsra	AGRS	fixed	2006	52	54	52.58929	6	36	16.20650	82.2751	0.3890	82.6641	236880.5080	548192.3070	40.7251	0.3890	41.1141	273	AOAD/M_T

Station	owner	status	Date	N ETRS89 (° '' ")			E ETRS89 (° '' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type
ame1	NAM	mobile	27-6-2009	53	27	51.94273	5	55	16.80631	47.9924	0.1480	48.1404	190474.9760	608822.4760	7.3984	0.1480	7.5464	2170510	TPSCR3_GGD CONE
anjm	NAM	mobile	27-6-2009	53	22	15.04179	6	9	8.59145	45.2711	0.0000	45.2711	205931.1410	598546.0410	4.6448	0.0000	4.6448	2170642	TPSCR3_GGD CONE
modd	NAM	mobile	27-6-2009	53	24	19.27163	6	4	2.98541	47.4159	0.1470	47.5629	200244.5590	602329.7960	6.8034	0.1470	6.9504	2170639	TPSCR3_GGD CONE



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#### A.4 Reference station coordinates 2011

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Date: 28-05-2011

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
0647	SAPOS	fixed	28-5-2011	53	20	14.76805	7	1	38.98444	56.9575	0.0550	57.0125	264259.0473	595802.0419	16.4613	0.0550	16.5163	10211016	LEIAR25.R4	LEIT
0687	SAPOS	fixed	28-5-2011	53	33	49.15576	6	44	50.78843	54.4054	0.0550	54.4604	245130.1219	620588.0031	14.2210	0.0550	14.2760	10211024	LEIAR25.R4	LEIT
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.3850	606186.3570	13.7208	0.1010	13.8218	2170556	TPSCR3_GGD	CONE
drac	06-GPS	fixed	27-6-2009	53	6	31.75455	6	4	58.04662	56.3480	0.1470	56.4950	201580.5870	569339.0610	15.0343	0.1470	15.1813	2170593	TPSCR3_GGD	CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.0960	610405.7140	10.3550	0.1480	10.5030	2170643	TPSCR3_GGD	CONE
ters	AGRS	fixed	28-5-2011	53	21	45.84880	5	13	9.78844	56.1032	0.0000	56.1032	143827.2394	597385.4907	14.6917	0.0000	14.6917	220193243	trm29659.00	
veen	06-GPS	fixed	28-5-2011	53	6	15.38193	6	51	54.03564	65.9204	0.1470	66.0674	253969.3881	569622.6763	24.9444	0.1470	25.0914	3830189	TPSCR.G3	TPSH
wsra	AGRS	fixed	2006	52	54	52.58929	6	36	16.20650	82.2751	0.3890	82.6641	236880.5080	548192.3070	40.7251	0.3890	41.1141	273	AOAD/M_T	

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
ame1	NAM	mobile	28-5-2011	53	27	51.94285	5	55	16.80630	47.9812	0.1480	48.1292	190474.9760	608822.4800	7.3872	0.1480	7.5352	2170510	TPSCR3_GGD	CONE
anjm	NAM	mobile	28-5-2011	53	22	15.04182	6	9	8.59135	45.2637	0.0000	45.2637	205931.1395	598546.0420	4.6374	0.0000	4.6374	2170642	TPSCR3_GGD	CONE
modd	NAM	mobile	28-5-2011	53	24	19.27163	6	4	2.98540	47.4103	0.1470	47.5573	200244.5584	602329.7957	6.7978	0.1470	6.9448	2170639	TPSCR3_GGD	CONE



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## A.5 Reference station coordinates 2012

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Date: 2-6-2012

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
0647	SAPOS	fixed	2-6-2012	53	20	14.76809	7	1	38.98431	56.9572	0.0550	57.0122	264259.0449	595802.0431	16.4610	0.0550	16.5160	10211016	LEIAR25.R4	LEIT
0687	SAPOS	fixed	28-5-2011	53	33	49.15576	6	44	50.78843	54.4054	0.0550	54.4604	245130.1219	620588.0031	14.2210	0.0550	14.2760	10211024	LEIAR25.R4	LEIT
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.3850	606186.3570	13.7208	0.1010	13.8218	2170556	TPSCR3_GGD	CONE
drac	06-GPS	fixed	2-6-2012	53	6	31.75461	6	4	58.04664	56.3471	0.1470	56.4941	201580.5878	569339.0630	15.0334	0.1470	15.1804	2170593	TPSCR3_GGD	CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.0960	610405.7140	10.3550	0.1480	10.5030	2170643	TPSCR3_GGD	CONE
ters	AGRS	fixed	28-5-2011	53	21	45.84880	5	13	9.78844	56.1032	0.0000	56.1032	143827.2394	597385.4907	14.6917	0.0000	14.6917	220193243	trm29659.00	
veen	06-GPS	fixed	2-6-2012	53	6	15.38207	6	51	54.03545	65.9170	0.1470	66.064	253969.3844	569622.6805	24.9410	0.1470	25.0880	3830189	TPSCR.G3	TPSH
wsra	AGRS	fixed	2006	52	54	52.58929	6	36	16.20650	82.2751	0.3890	82.6641	236880.5080	548192.3070	40.7251	0.3890	41.1141	273	AOAD/M_T	

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
ame1	NAM	mobile	2-6-2012	53	27	51.94291	5	55	16.80625	47.9750	0.1480	48.1230	190474.9750	608822.4818	7.3810	0.1480	7.5290	2170510	TPSCR3_GGD	CONE
anjm	NAM	mobile	2-6-2012	53	22	15.04185	6	9	8.59128	45.2608	0.0000	45.2608	205931.1382	598546.0429	4.6345	0.0000	4.6345	2170642	TPSCR3_GGD	CONE
modd	NAM	mobile	2-6-2012	53	24	19.27163	6	4	2.98536	47.4073	0.1470	47.5543	200244.5576	602329.7956	6.7948	0.1470	6.9418	2170639	TPSCR3_GGD	CONE



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## A.6 Reference station coordinates 2013

Transformation to RD/NAP based on RDNAPTRANS2004  
Date: 1-6-2013

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
0647	SAPOS	fixed	1-6-2013	53	20	14.76812	7	1	38.98408	56.9572	0.0550	57.0122	264259.041	595802.044	16.461	0.055	16.516	10211016	LEIAR25.R4	LEIT
0687	SAPOS	fixed	28-5-2011	53	33	49.15576	6	44	50.78843	54.4054	0.0550	54.4604	245130.122	620588.003	14.221	0.055	14.276	10211024	LEIAR25.R4	LEIT
ball	06-GPS	fixed	2006	53	26	29.58829	5	41	15.67011	54.5499	0.1010	54.6509	174967.385	606186.357	13.721	0.101	13.822	2170556	TPSCR3_GGD	CONE
drac	06-GPS	fixed	1-6-2013	53	6	31.75472	6	4	58.04659	56.3471	0.1470	56.4941	201580.587	569339.066	15.033	0.147	15.180	2170593	TPSCR3_GGD	CONE
schi	NAM	fixed	2006	53	28	38.43917	6	9	44.16452	50.8109	0.1480	50.9589	206461.096	610405.714	10.355	0.148	10.503	2170643	TPSCR3_GGD	CONE
ters	AGRS	fixed	28-5-2011	53	21	45.84880	5	13	9.78844	56.1032	0.0000	56.1032	143827.239	597385.490	14.692	0.000	14.692	220193243	trm29659.00	
wsra	AGRS	fixed	2006	52	54	52.58952	6	36	16.20634	82.2751	0.3890	82.6641	236880.505	548192.313	40.725	0.389	41.114	273	AOAD/M_T	

Station	owner	status	Date	N ETRS89 (° ' ")			E ETRS89 (° ' ")			ell.h. (m)	ant.h. (m)	ARP (m)	X-RD (m)	Y-RD (m)	NAP(m)	ant.h.(m)	ARP(m)	ser.no.ant.	ant. Type	
ame1	NAM	mobile	1-6-2013	53	27	51.94297	5	55	16.80627	47.9691	0.1480	48.1171	190474.975	608822.483	7.375	0.148	7.523	2170510	TPSCR3_GGD	CONE
anjm	NAM	mobile	1-6-2013	53	22	15.04189	6	9	8.59121	45.2577	0.0000	45.2577	205931.137	598546.044	4.631	0.000	4.631	2170642	TPSCR3_GGD	CONE
modd	NAM	mobile	1-6-2013	53	24	19.27163	6	4	2.98533	47.4022	0.1470	47.5492	200244.557	602329.795	6.790	0.147	6.937	2170639	TPSCR3_GGD	CONE
tenp	NAM	mobile	1-6-2013	53	17	57.24969	6	44	40.74112	47.6573	0.1480	47.8053	245500.603	591158.827	7.107	0.148	7.255	762-10980	TPSCR.G5	TPSH
veen	NAM	mobile	1-6-2013	53	6	15.38219	6	51	54.03528	65.9142	0.1470	66.0612	253969.381	569622.684	24.938	0.147	25.085	3830189	TPSCR.G3	TPSH