

ANEJO Nº 4. CARTOGRAFÍA

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1. INTRODUCCIÓN

El presente anejo tiene como objeto describir la cartografía utilizada para esta fase, a escala 1:5.000 y escala 1:1.000, del “Estudio Informativo de la Línea Ferroviaria de Alta Velocidad Madrid – Extremadura. Tramo: Madrid – Oropesa.”

Se ha empleado como base la cartografía oficial del Instituto Geográfico Nacional (I.G.N.) a escala 1:25.000 y 5.000 disponibles.

En cuanto al municipio de Talavera de la Reina, se dispone de la cartografía elaborada para la redacción del documento “El de integración urbana del AVE en Talavera de la Reina”, basada en un vuelo digital realizado en septiembre de 2008 a escala 1:4.000 que permite restituciones de planos a escala 1:1000 y también a escala 1:500 la cual se ha procedido a su actualización.

El objeto de los apartados que se desarrollan a continuación es la descripción de la metodología y de los aspectos técnicos necesarios para obtener la cartografía utilizada. Asimismo se justifica que esta cumple los requerimientos de precisión exigidos en la escala de trabajo de la presente fase.

2. VUELO FOTOGRAMÉTRICO

Con fecha 1 de agosto de 2019 y 12 de julio de 2019 se han realizado vuelos fotogramétricos exprofeso para la generación y actualización de cartografías a escalas 1/5.000 y 1/1.000. Estos vuelos tienen un GSD (Ground Sample Distance) de 25 cm en el caso del vuelo para cartografía a escala 1/5.000 y de 9 cm en el caso de la escala 1/1.000.

El vuelo realizado se ha ajustado previamente sobre cartografía a escala 1:25.000 de forma que cubriera ampliamente la zona a cartografiar.

El vuelo ha sido realizado por la empresa colaboradora Servicios Politécnicos Aéreos, S.A. (SPASA), con autorización de la Dirección General de Aviación Civil.

El avión empleado ha sido un avión bimotor CESSNA T-310-R provisto de sistema de navegación GPS NOVATEL de doble frecuencia, con una precisión mayor de 0,15m.

Las imágenes fotográficas se han obtenido con una cámara métrica aérea digital UltraCam Eagle-80 con un tamaño de pixel de 5.2 μ m, la cual se instala sobre plataforma giroestabilizada que permite mantener su verticalidad y de modo que atenúe los efectos de las vibraciones del avión, además de estar dotada de un mecanismo compensador del desplazamiento del avión (FMC).

La cámara tiene una distancia focal de 79.8 mm y un formato de imagen de 13080 x 20010 píxeles. Se entrega el correspondiente certificado de calibración de la cámara empleada.

El vuelo se ha realizado de acuerdo a las siguientes condiciones técnicas, que han sido verificadas una vez recibida toda la documentación:

- Los últimos fotogramas de cada pasada se superponen a los primeros de la siguiente pasada.
- Los ejes de los fotogramas de número de orden “n” y “n+2” han de estar comprendidos entre 195 a 205 grados centesimales.
- El recubrimiento longitudinal es de un 60%, con un error máximo del 5%.
- La pasada se ha realizado de forma ininterrumpida.
- La altura media del vuelo ha sido de 3837 metros en el caso del GSD de 25 cm y de 1381 metros en el caso del GSD de 9 cm.

- El vuelo se ha realizado con cielo despejado para poder obtener imágenes bien definidas y con el terreno en situación normal.

Se adjuntan los datos de Informe y gráfico de vuelo.

3. SISTEMA DE REFERENCIA

En el desarrollo de los trabajos se ha utilizado el Sistema de Referencia Europeo (ETRS89), actualmente el único oficial en España, constituido por:

Elipsoide GRS80:

Longitud del Semieje mayor del elipsoide (a) = 6.378.137 metros

Coeficiente de aplanamiento (α) = 1:298,257223563

Orígenes de coordenadas geodésicas:

Latitudes, referidas al Ecuador, positivas al Norte del mismo.

Longitudes referidas al Meridiano de Greenwich, consideradas positivas al Este y negativas al Oeste de dicho Meridiano.

Para realizar el enlace al sistema de referencia ETRS89, se ha empleado la red activa del Instituto Geográfico Nacional (IGN), mediante observaciones GPS en tiempo real desde esta red.

La altimetría se ha referido al nivel medio del mar en Alicante, enlazando con la Red de Nivelación de Alta Precisión (R.N.A.P) mediante la aplicación del modelo del geoide EGM08-REDNAP.

El sistema utilizado de proyección es el UTM, referido al Huso 30.

4. APOYO DE CAMPO

Se han realizado los trabajos de campo necesarios para determinar la posición planimétrica y altimétrica de los puntos de apoyo necesarios para la restitución fotogramétrica.

Los puntos de apoyo se han observado siguiendo estas pautas:

- Se han obtenido 2 puntos de apoyo en el primer modelo y último de cada pasada, y un punto más cada ocho modelos.
- Los puntos de apoyo en el primer y último modelo de cada pasada están a una distancia de la esquina del fotograma no inferior a 1,5 cm y no superior de 4 cm.
- Hay al menos un punto de apoyo en el interior de la pasada.

La observación de los puntos de apoyo se ha realizado mediante técnicas GPS, contando con equipos Trimble SPS 985, compuestos por receptores GPS de doble frecuencia. La observación de los puntos se ha realizado en tiempo real (RTK). La configuración de la constelación de satélites ha sido tal que la precisión por la posición de los satélites (PDOP) ha sido inferior a 5 en todas las observaciones.

Se han cumplimentado hojas de campo para cada punto de apoyo con los parámetros y comentarios que facilitan la detección e identificación de posibles errores de cálculo.

El número total de puntos de apoyo observados ha sido de 67.

Para la transformación de coordenadas geodésicas ETRS89 con cota elipsoidal a la proyección UTM en el sistema ETRS89 con alturas ortométricas se ha utilizado la técnica descrita en el enlace al sistema de referencia.

Se ha verificado que las precisiones que se han obtenido para los puntos de apoyo son inferiores a las tolerancias necesarias para este tipo de trabajos.

En los apéndices correspondientes se adjuntan los siguientes datos:

- Gráfico de distribución de los puntos de apoyo de campo.
- Coordenadas ETRS89 de los puntos de apoyo.
- Reseñas de los puntos de apoyo.

5. AEROTRIANGULACIÓN DIGITAL

A partir de los datos obtenidos del vuelo fotogramétrico (fotocentros y datos GPS/INS) y de los puntos apoyo obtenidos en campo, se realiza el cálculo de la aerotriangulación digital del vuelo.

Se utiliza la aplicación MATCH-AT de INPHO, que permite realizar el cálculo de grandes bloques de fotogramas, proporcionando una aerotriangulación automática y de alta precisión.

El proceso de aerotriangulación automática combina técnicas de correlación para generar puntos de paso automáticamente, mientras que la auto-orientación interna reduce la interacción del operador y permite la detección de marcas fiduciales. La medición de puntos de control en 3D se realiza en un estereocomparador tridimensional que permite su realización incluso en áreas de pobre detalle.

Es posible manejar datos de centros de proyección y ángulos inerciales de diferentes sistemas, y adicionalmente se pueden introducir parámetros adicionales de deriva y desplazamiento así como el cálculo de la desalineación de la antena o "boresight". Permite la división en sub-bloques y el análisis y representación gráfica de los resultados, lo que posibilita la fácil inspección de grandes cantidades de datos, la representación del apoyo y los puntos de paso y el control de calidad y análisis de datos interactivo. Los resultados pueden ser utilizados directamente en las estaciones fotogramétricas digitales.

Preparado el bloque, una vez que las imágenes digitales y sus datos GPS/INS están listos, el único proceso interactivo es la medida de los puntos de control y el establecimiento de los parámetros de cálculo.

Los procesos que se han seguido son los siguientes:

- Generación de imágenes piramidales: MATCH-AT funciona con imágenes piramidales, que son utilizadas sobre todo en los procesos de correlación a la hora de generar los puntos de paso automáticos.
- Creación del proyecto: Hemos definido el proyecto introduciendo los datos de la cámara (certificado de calibración), importando las imágenes del vuelo, importando los datos GPS/INS, importando los puntos de apoyo como puntos de control y fijando las desviaciones estándar.

- Comprobación del bloque: Se ha comprobado la posición relativa de todos los elementos y el solape de las imágenes dentro del bloque.
- Generación puntos de paso: A través de algoritmos de correlación se han extraído automáticamente puntos de paso y enlace. Estos puntos se han generado en las zonas de Von Grüber que el software localiza automáticamente teniendo en cuenta el proceso de inicialización anterior. Se han medido un mínimo de tres puntos por cada zona.
- En caso de ser necesario, se han realizado mediciones manuales de puntos de paso, no solamente en las áreas de Von Grüber, sino también en aquellas zonas que necesitemos definir.
- Comprobación de puntos de paso y su distribución: Una vez generados los puntos automáticos, hemos podido comprobar la distribución y número de puntos generados. En caso de que no haya una buena distribución o de un número escaso se han medido manualmente más puntos.
- Medición de puntos de control: El programa nos permite medir en modo estereoscópico, y en todas las imágenes donde aparece, los puntos de control (puntos de apoyo).
- Postproceso: Una vez obtenidos los resultados se han analizado, estudiando la distribución de puntos de paso, residuos y errores de puntos de control, elipses de error, etc.
Se ha repetido el proceso hasta que se ha obtenido un resultado satisfactorio y no haya ninguna medida eliminada en el ajuste. Como último proceso se han distribuido los errores residuales aceptados en todo el bloque de forma uniforme.

En todo el proceso de cálculo de la aerotriangulación las precisiones han sido las siguientes:

- El error medio cuadrático en el ajuste interno del bloque ha sido de menos de 5 micras.
- El error medio cuadrático de los errores residuales en los puntos medidos ha sido de menos de 10 cm.

Como resultado final del proceso de aerotriangulación digital se ha obtenido un fichero ASCII compatible con los sistemas de restitución, con los parámetros de orientación externa de los fotogramas, X, Y, Z de los centros de proyección y los giros omega, phi, kappa.

En el Apéndice correspondiente se adjuntan los datos resultantes del proceso de aerotriangulación.

6. RESTITUCIÓN

Los planos se han restituído a escala 1:1000 con equidistancia entre curvas de nivel de un metro (1 m), y a escala 1:5000 con equidistancia entre curvas de nivel de cinco metros (5 m) a partir de los vuelos realizados y sus correspondientes apoyos de campo.

Se ha empleado restituidores digitales “Delta DPS” que se componen de codificadores de una micra y para digitalización 3D permiten obtener precisiones mayores que el tamaño del pixel.

Los restituidores “Delta DPS” trabajan sobre el sistema DIGI, que asegura la continuidad numérica de las líneas o entidades que pertenezcan a diferentes pares, el cierre analítico de figuras cerradas y la continuidad de líneas que se apoyan en otras ya existentes.

Una vez realizadas las orientaciones, se ha procedido a la restitución de la cartografía mediante la toma y almacenamiento de registros tridimensionales en el sistema informático DIGI.

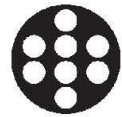
La restitución planimétrica se ha efectuado punto a punto, posicionándose en las líneas poligonales en cada uno de los puntos de inflexión, registrando sus coordenadas y código numérico correspondiente. Las líneas curvas se han restituído también punto a punto para garantizar su máxima precisión.

Los planos reflejan todos los detalles planimétricos del terreno que son visibles e identificables en el vuelo, representándolos a escala y posición exacta siempre que sus dimensiones equivalentes resulten superiores a un milímetro.

Figuran las cotas altimétricas en aquellos puntos que por su situación o condiciones ha convenido definir.

Una vez generada la cartografía en la aplicación DIGI, se exportan a formato DXF, para su tratamiento y edición, con el fin de obtener la cartografía final.

7. APÉNDICE 1: VUELO FOTOGRAMÉTRICO. CERTIFICADO DE CALIBRACIÓN DE LA CÁMARA



VEXCEL
IMAGING

ULTRACAM

Field Calibration Report



www.vexcel-imaging.com

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Bahia, Brasil 2013

Photo on page 1 courtesy of Hiparc Geotecnologia, Brasil

www.hiparc.com

UltraCam Lp, GSD25 cm, RGB

www.vexcel-imaging.com



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Calibration Procedure

The purpose of the Field Calibration is a verification of the camera status and calibration and consists of three major steps:

1. Test flight performed by customer
2. Processing of images and aerotriangulation (AT) by Vexcel Imaging GmbH
3. Analysis of AT results by Vexcel Imaging GmbH
4. Provide the new calibration data set and the report

Available Data

Test flight at customer's test site:

- Date of flight: 29/05/2019
- Number of images: 193 (total)
- Flying heights: 1830 m (GSD 7 cm)
3050 m (GSD 15 cm)
- Number of images: 145 (GSD 7 cm)
48 (GSD 15 cm)
- Ground Control Points: 7 (15 used as check points)
- Postprocessed GPS/IMU: available

Flight lines look very well done and show good overlap and image quality.

A-priori standard deviations settings

- Image measurements (x,y): 2,3 μ m
- Ground Control Points (x/y/z): 50 mm / 50 mm / 70 mm
- GNSS Position (x,y/ z): 30 mm / 30 mm
- IMU Pose (p,o/ k): 30 mgon / 40 mgon

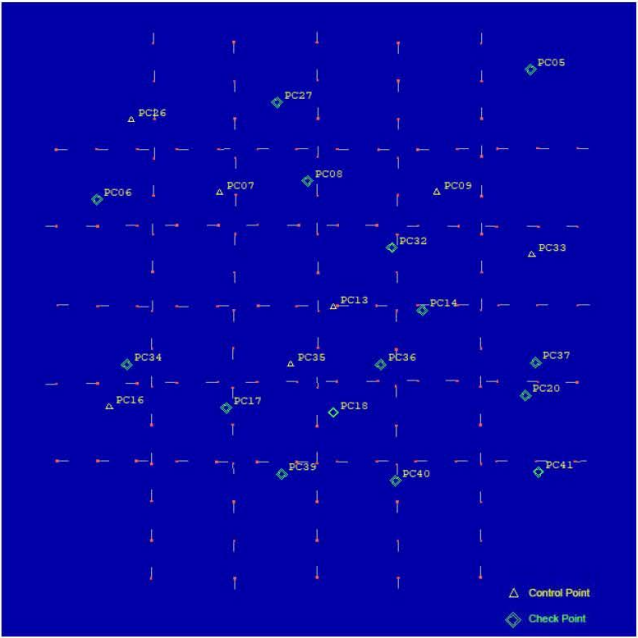
SN: UC-E-1-50016095-f80

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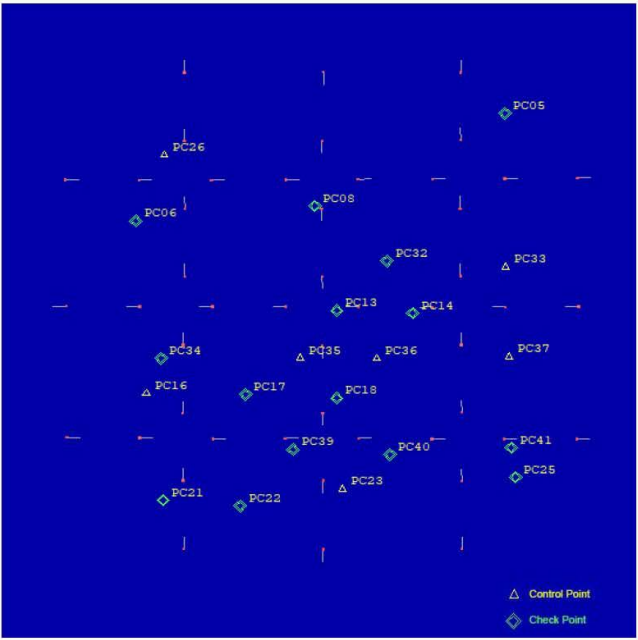


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- Flight at 1830 m (GSD 7 cm):



- Flight at 3050 m (GSD 15 cm):



SN: UC-E-1-50016095-f80

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Results

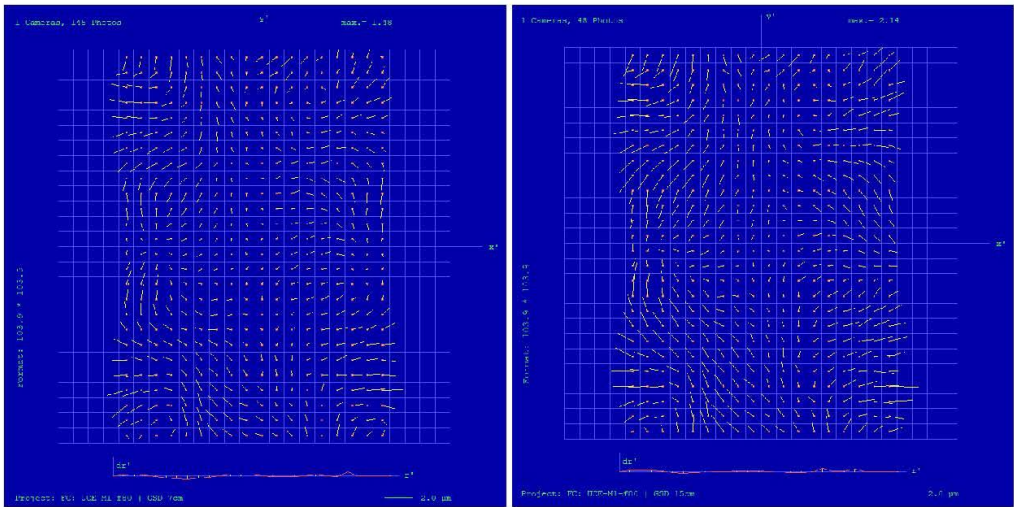
of the Aerial Triangulation with calibration Rev 7.0 (lab calibration), as currently used by the customer.

The data was processed in UltraMap v4.4.7 by Vexcel Imaging GmbH (Process to Lvl02, Automated Tie Point Collection, Ground Control Point measurements, Bundle Adjustment and Analysis).

The results of the Bundle Adjustment are shown in the table below.

	Flight 1830 m (GSD 7 cm)	Flight 3050 m (GSD 15 cm)
Sigma 0	1.29	1.31
Mean photo scale	1:13639	1:28954
RMSE of 15 check points X/Y/Z	39/27/36 mm	31/43/59 mm
RMSE of 7 control points X/Y/Z	38/34/33 mm	37/20/33 mm
Number of used Tiepoints	20546	8165
Refraction Correction	used	used
Earth curvature correction	used	used
Residuals of photo measurements (x', y') in photo space (unit μm):	RMS 1.2, 1.0 MAX 5.2, 6.2	RMS 1.2, 1.1 MAX 6.7, 5.7

The remaining residuals in the image of the camera are shown in the plots below.



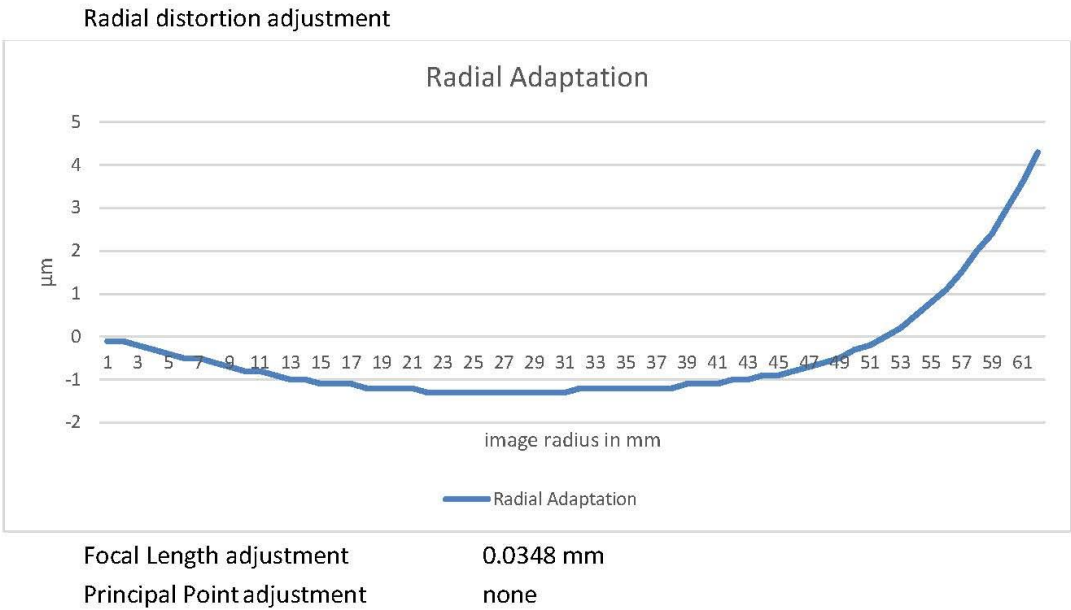
SN: UC-E-1-50016095-f80

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Geometric adjustment



Change in focal length is compensated via a scale parameter in the digital calibration dataset. The nominal focal length and principle point as given on pages 9 and 10 are valid for further photogrammetric processing.

Additional local corrections in the image plane are computed from both flight missions at 7 cm GSD and 15 cm GSD. The averaged correction values are applied to the camera calibration data set based on a 1 mm by 1 mm look up table. The magnitude of these corrections in x and y is illustrated in the figure below and shows the correction values at 117 even spaced image positions.

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	-32	-24	-16	-8	0	8	16	24	32
48	10.3 -13.6	8.2 -14.2	5.6 -14.2	2.6 -14.8	0.0 -14.9	-2.7 -14.9	-6.6 -15.4	-9.8 -16.4	-12.5 -16.8
40	11.4 -12.3	8.7 -12.5	5.8 -12.4	2.7 -12.9	-0.1 -12.9	-2.8 -13.0	-6.6 -13.5	-10.1 -14.3	-13.3 -14.8
32	11.8 -9.8	9.0 -10.1	5.9 -10.1	2.8 -10.5	-0.1 -10.5	-3.0 -10.7	-6.5 -11.0	-10.1 -11.4	-13.5 -11.7
24	11.9 -6.8	9.1 -7.2	6.0 -7.5	2.9 -7.9	-0.1 -8.0	-3.1 -8.3	-6.4 -8.3	-10.0 -8.2	-13.4 -8.0
16	10.7 -3.4	8.6 -4.0	6.2 -4.6	3.0 -5.1	0.0 -5.0	-3.0 -5.2	-6.6 -5.0	-9.5 -4.7	-12.1 -4.4
8	10.4 -1.5	8.4 -1.9	6.1 -2.2	3.1 -2.7	0.0 -2.6	-3.1 -2.7	-6.5 -2.5	-9.3 -2.2	-11.8 -2.0
0	10.2 0.2	8.2 0.2	5.9 0.2	3.1 0.0	0.0 0.0	-3.1 0.0	-6.3 0.0	-9.0 0.2	-11.6 0.4
-8	10.2 1.9	8.1 2.3	5.9 2.7	3.1 2.7	0.0 2.6	-3.1 2.7	-6.2 2.5	-9.0 2.6	-11.5 2.8
-16	10.2 3.7	8.1 4.4	5.7 5.1	3.0 5.1	0.0 5.0	-3.0 5.2	-6.0 5.0	-8.9 5.1	-11.5 5.2
-24	11.1 6.7	8.7 7.1	6.1 7.5	3.5 7.8	0.3 7.8	-2.9 7.9	-6.1 8.0	-9.2 8.0	-12.2 7.9
-32	11.1 9.6	8.7 9.7	6.0 9.7	3.4 10.2	0.4 10.3	-2.7 10.6	-5.9 10.6	-9.3 10.9	-12.5 11.0
-40	10.8 11.9	8.5 12.0	6.0 11.7	3.4 12.4	0.5 12.7	-2.5 13.2	-5.8 13.0	-9.3 13.5	-12.5 13.6
-48	9.8 13.0	8.1 13.4	5.8 13.2	3.4 14.2	0.6 14.7	-2.2 15.3	-5.5 14.9	-8.9 15.2	-11.8 15.0

Image correction in x and y given in μm at 117 image positions at an 8 mm grid.

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Results

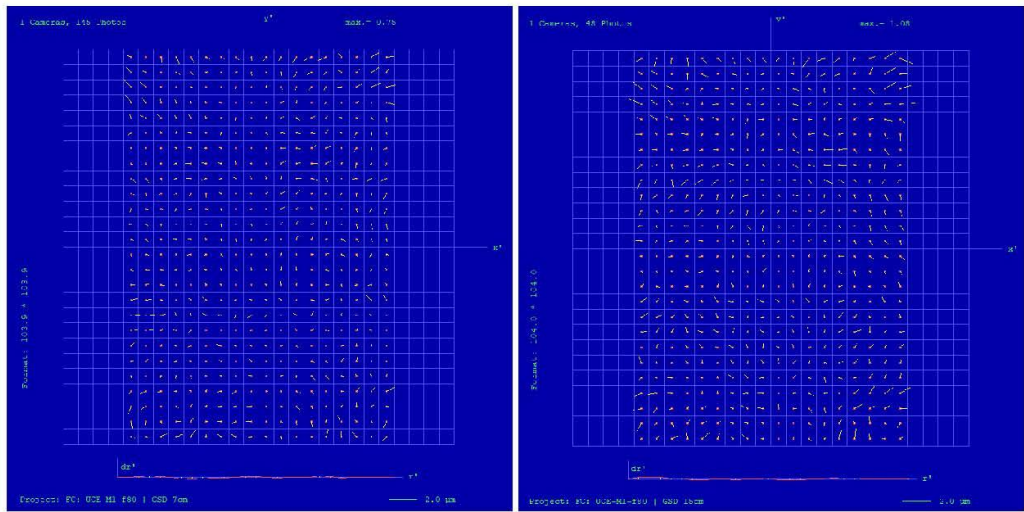
of the Aerial Triangulation with calibration Rev 8.0, this field calibration, which includes the geometric adjustments listed above and will serve as the new calibration for the customer.

The data was processed in UltraMap v4.4.7 by Vexcel Imaging GmbH (Process to Lvl02, Automated Tie Point Collection, Ground Control Point measurements, Bundle Adjustment and Analysis).

The results of the Bundle Adjustment are shown in the table below.

	Flight 1830 m (GSD 7 cm)	Flight 3050 m (GSD 15 cm)
Sigma 0	1.02	1.09
Mean photo scale	1:13634	1:28944
RMSE of 15 check points X/Y/Z	38/18/37 mm	30/41/38 mm
RMSE of 7 control points X/Y/Z	33/25/29 mm	31/28/28mm
Number of used Tiepoints	20564	8033
Refraction Correction	Used	used
Earth curvature correction	Used	used
Residuals of photo measurements (x', y') in photo space:	RMS 1.1, 0.9 MAX 6.3, 6.3	RMS 1.0, 0.9 MAX 5.2, 5.1

The remaining residuals in the image of the camera are shown in the plots below.



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Geometric Specifications

Camera: UltraCam Eagle Mark 1
Serial: UC-E-1-50016095-f80

Panchromatic Camera: ck = 79.800 mm
Multispectral Camera: ck = 79.800 mm

PPA Information: X: 0.000 mm
Y: 0.000 mm



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Panchromatic Camera

Large Format Panchromatic Output Image

Image Format	long track	68.016 mm	13080 pixel
	cross track	104.052 mm	20010 pixel
Image Extent		(-34.008, -52.026) mm	(34.008, 52.026) mm
Pixel Size		5.200 μm*5.200 μm	
Focal Length	ck	79.800 mm	± 0.002 mm
Principal Point (Level 2)	X_ppa	0.000 mm	± 0.002 mm
	Y_ppa	0.000 mm	± 0.002 mm
Lens Distortion	Remaining Distortion less than 0.002 mm		

Multispectral Camera

Medium Format Multispectral Output Image (Upscaled to panchromatic image format)

Image Format	long track	68.016 mm	4360 pixel
	cross track	104.052 mm	6670 pixel
Image Extent		(-34.008, -52.026) mm	(34.008, 52.026) mm
Pixel Size		15.600 μm*15.600 μm	
Focal Length	ck	79.800 mm	± 0.002 mm
Principal Point (Level 2)	X_ppa	0.000 mm	± 0.002 mm
	Y_ppa	0.000 mm	± 0.002 mm
Lens Distortion	Remaining Distortion less than 0.002 mm		



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Conclusion

The tables and plots above show acceptable results for the processing with the new camera calibration (Rev 8.0). The calibration was verified with two datasets of the same test area acquired at different altitudes. The remaining distortions in the image are within an acceptable range.

This equipment is operating within specification as defined by Vexcel Imaging GmbH.

Dr. Michael Gruber
Chief Scientist, Photogrammetry
Vexcel Imaging GmbH

Philipp Zettl, BSc
Application Specialist
Vexcel Imaging GmbH

8. APÉNDICE 2: VUELO FOTOGRAMÉTRICO. INFORME DE VUELO



Informe de vuelo fotogramétrico

Nº DE O.T.: 19/0060

DENOMINACIÓN de vuelo:	
TÍTULO:	ZONAS TOLEDO (LAGARTERA-OROPESA, TALAVERA DE LA REINA, TOLEDO)
LOCALIZACIÓN de vuelo:	
PROVINCIA:	TOLEDO
HUSO:	30
H.M.N:	604, 605, 625, 626, 627, 628 Y 629
MEDIOS utilizados:	
AERONAVE:	
MATRÍCULA:	EC-NDX
CÁMARA:	ULTRA CAMEAGLE-80
FOCAL:	79.8
CARACTERÍSTICAS del vuelo:	
GSD (Ground Side Distance):	9 CM
ALTURA MEDIA SOBRE EL TERRENO:	1.381 M
RECUBRIMIENTOS:	
LONGITUDINAL (%):	60
TRANSVERSAL (%):	30
NÚMERO DE PASADAS:	4
FECHA DE VUELO:	12/07/19
Datos IMÁGENES:	
PROCESADO DE IMÁGENES:	PROCESO REALIZADO A 270º
CANALES PROCESADOS:	RGB 08 BITS

Ctra. de la Fortuna S/N. Aeropuerto de Cuatro Vientos, Sector A. 28054 (MADRID).
Tlf: 91 560 57 17. Fax.: 91 469 49 06. E-Mail: spasa@spasa.com o fotografiaaerea@spasa.es
Web: www.spasa.com



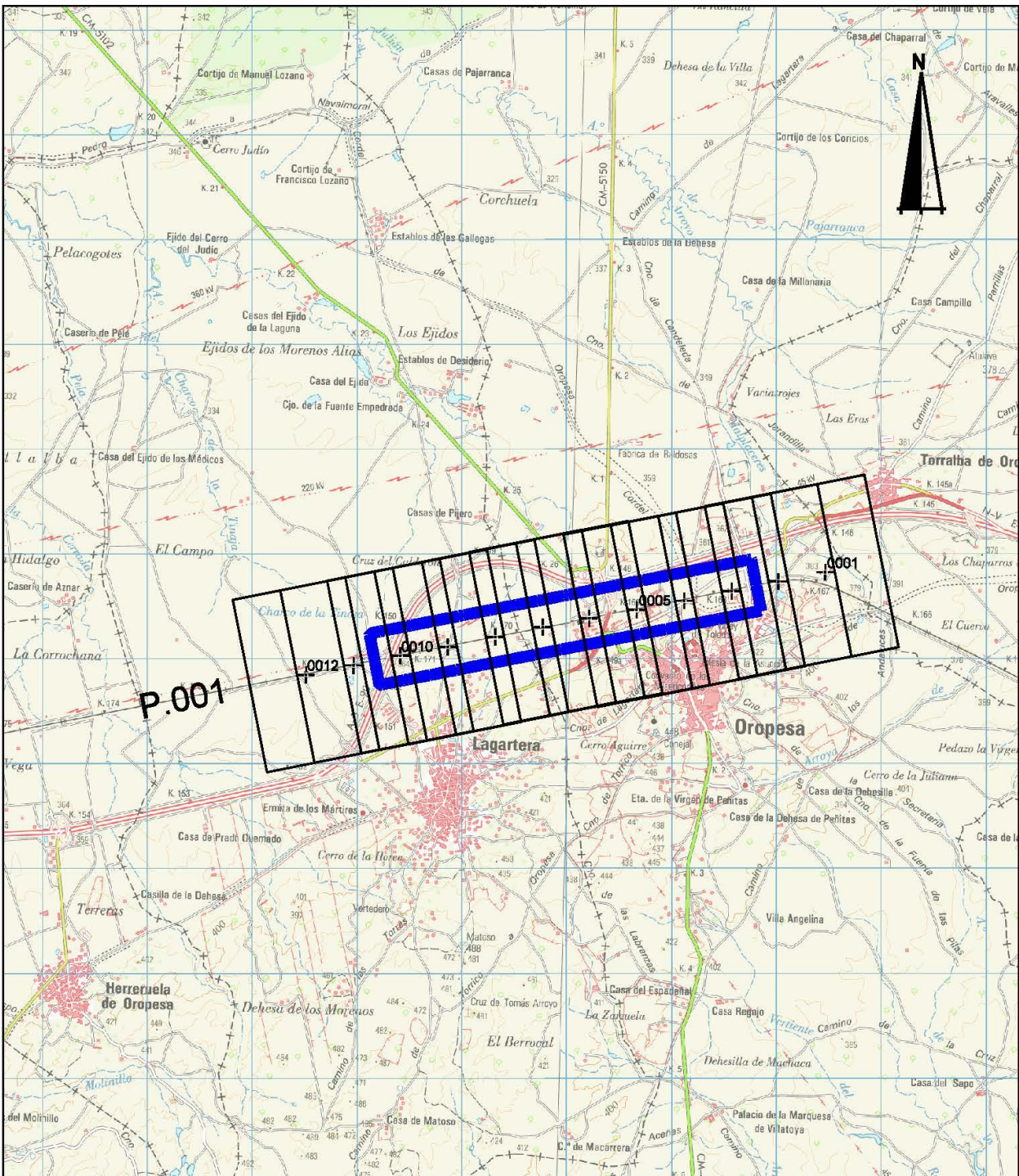
Informe de vuelo fotogramétrico

Nº DE O.T.: 19/0060

DENOMINACIÓN de vuelo:	
TÍTULO:	ZONAS TOLEDO
LOCALIZACIÓN de vuelo:	
PROVINCIA:	TOLEDO
HUSO:	30
H.M.N:	604, 605, 625, 626, 627, 628 Y 629
MEDIOS utilizados:	
AERONAVE:	
MATRÍCULA:	EC-NDX
CÁMARA:	ULTRA CAMEAGLE-80
FOCAL:	79.8
CARACTERÍSTICAS del vuelo:	
GSD (Ground Side Distance):	25 CM
ALTURA MEDIA SOBRE EL TERRENO:	3.837 M
RECUBRIMIENTOS:	
LONGITUDINAL (%):	60
TRANSVERSAL (%):	30
NÚMERO DE PASADAS:	8
FECHA DE VUELO:	01/08/19
Datos IMÁGENES:	
PROCESADO DE IMÁGENES:	PROCESO REALIZADO A 270º
CANALES PROCESADOS:	RGB 08 BITS

Ctra. de la Fortuna S/N. Aeropuerto de Cuatro Vientos, Sector A. 28054 (MADRID).
Tlf: 91 560 57 17. Fax.: 91 469 49 06. E-Mail: spasa@spasa.com o fotografiaaerea@spasa.es
Web: www.spasa.com







Servicios Politécnicos Aéreos, S.A.

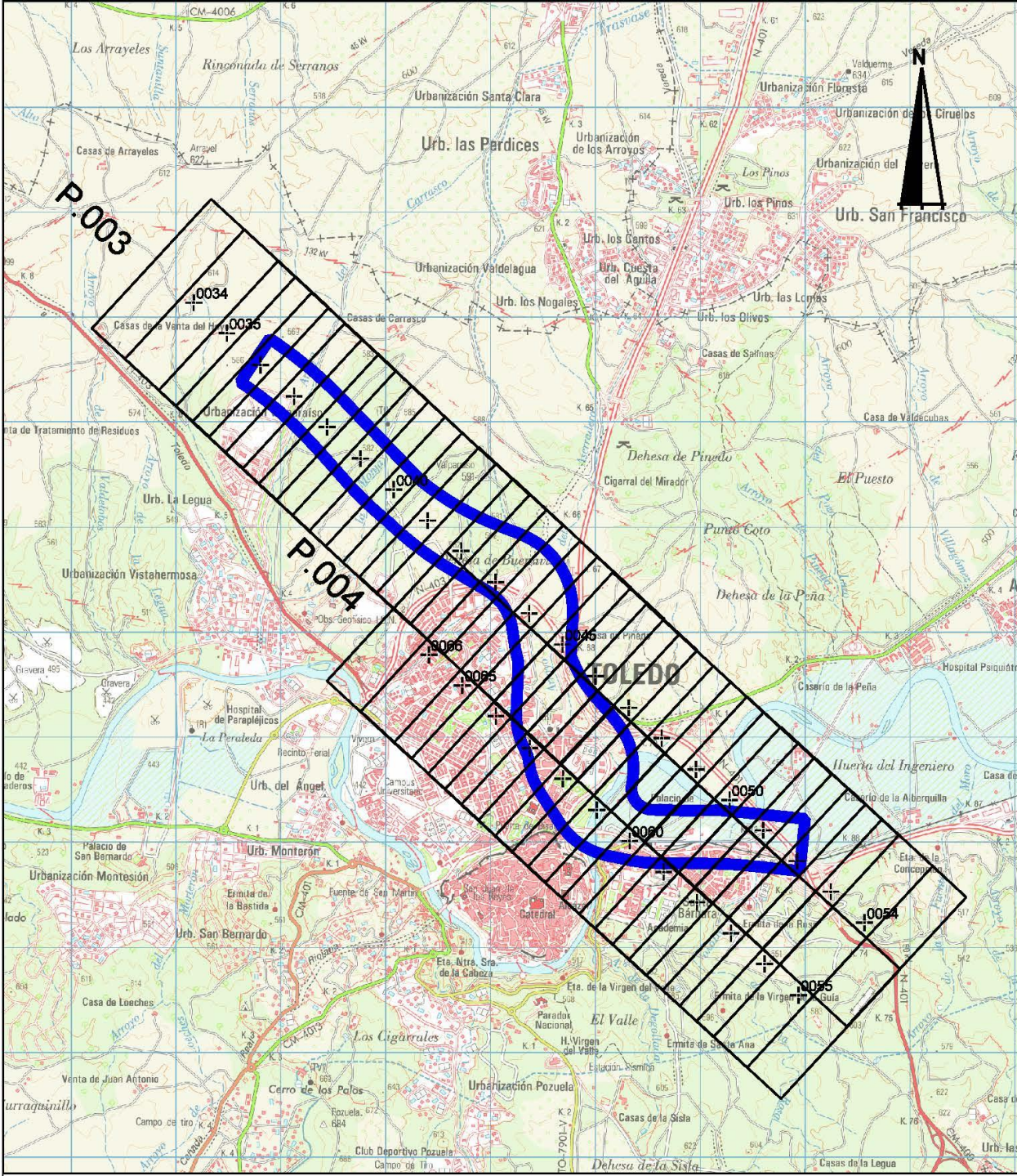
Ctra. de la Fortuna s/n. Aeropuerto de Cuatro Vientos. Sector A. 28054 (MADRID).

Tlf. : 91 560 57 17- Fax.: 91 469 49 06 - E-Mail: spasa@spasa.com

GRÁFICO DE VUELO

Ref.: 19/0060. 1 de 3.

Cliente:	Geo 360				
Zona/s:	Lagartera-Oropesa				
Provincia/s:	Toledo		H.M.N.:	625	
Resolución:	9 CM		Recubrimientos Long. y Transv.:	60 % y 0%	
Cámara/s:	Ultra CAM Eagle 80		Focal/es:	79.8	
Avión/es:	Cessna 421				
Fecha/s de vuelo:	12/07/2019				
Sistema geográfico de referencia del gráfico:	Etrs89	Huso/s del gráfico:	30	Escala gráfico:	1:50.000





Servicios Politécnicos Aéreos, S.A.

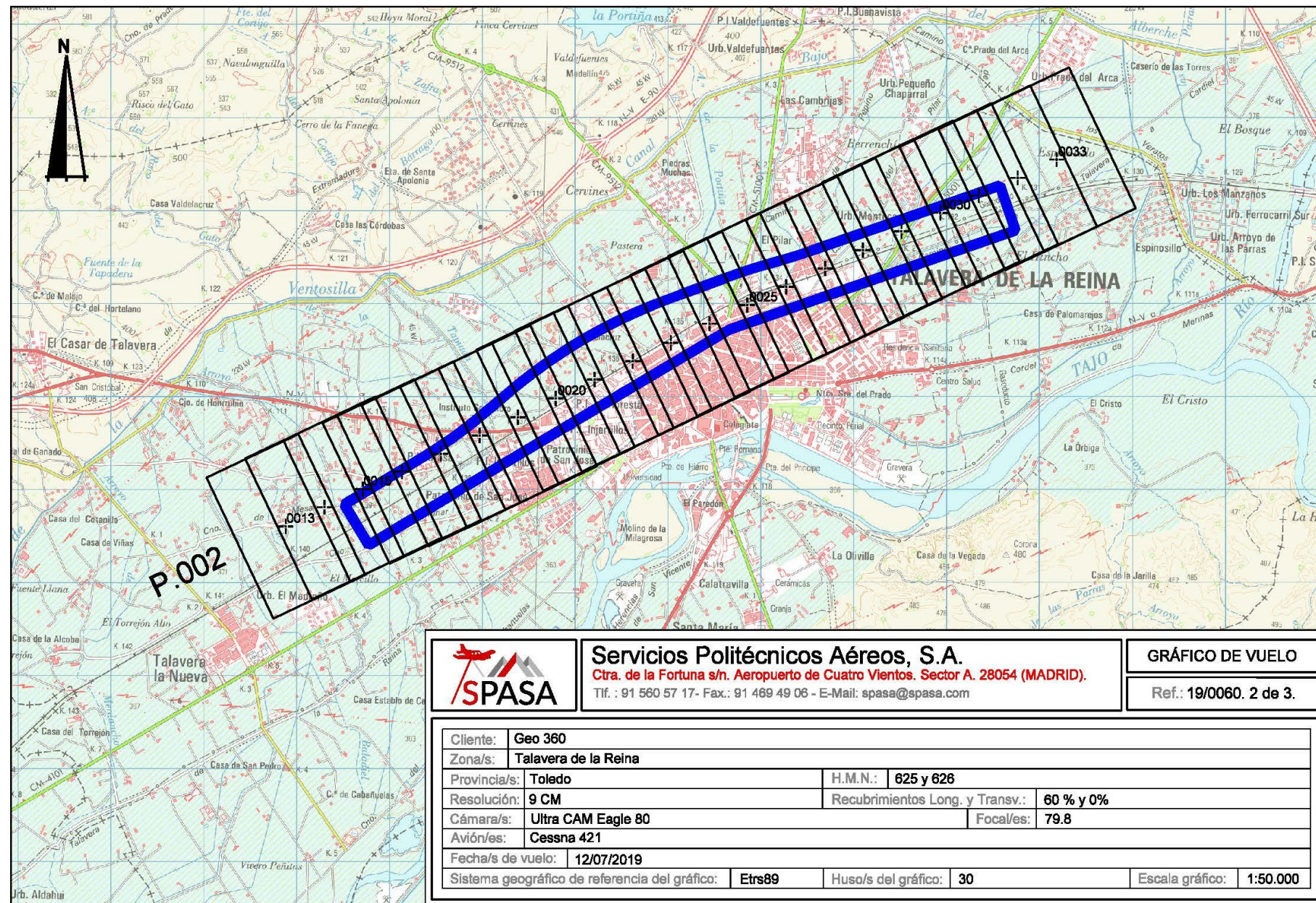
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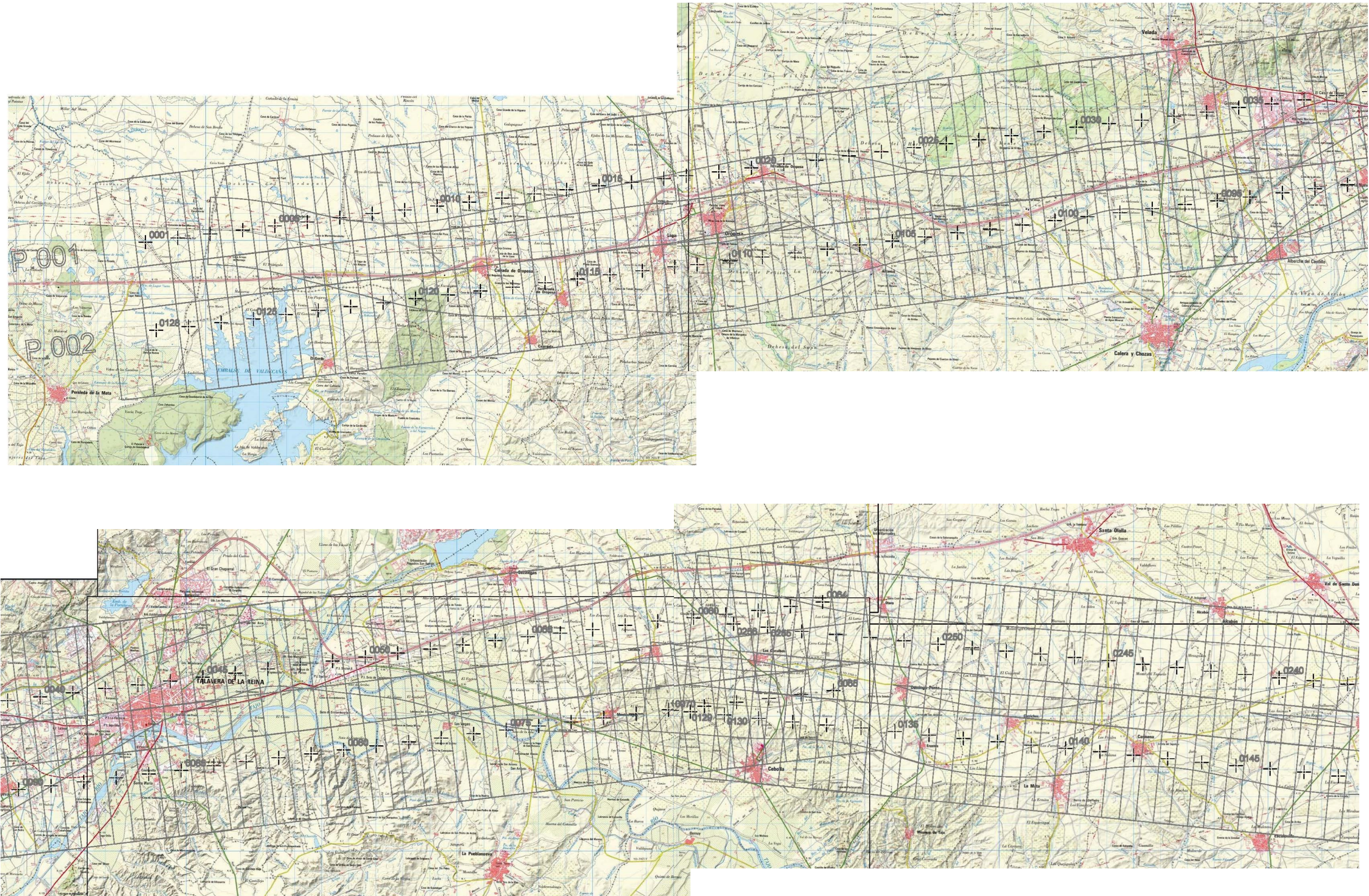
Tlf. : 91 560 57 17- Fax.: 91 469 49 06 - E-Mail: spasa@spasa.com

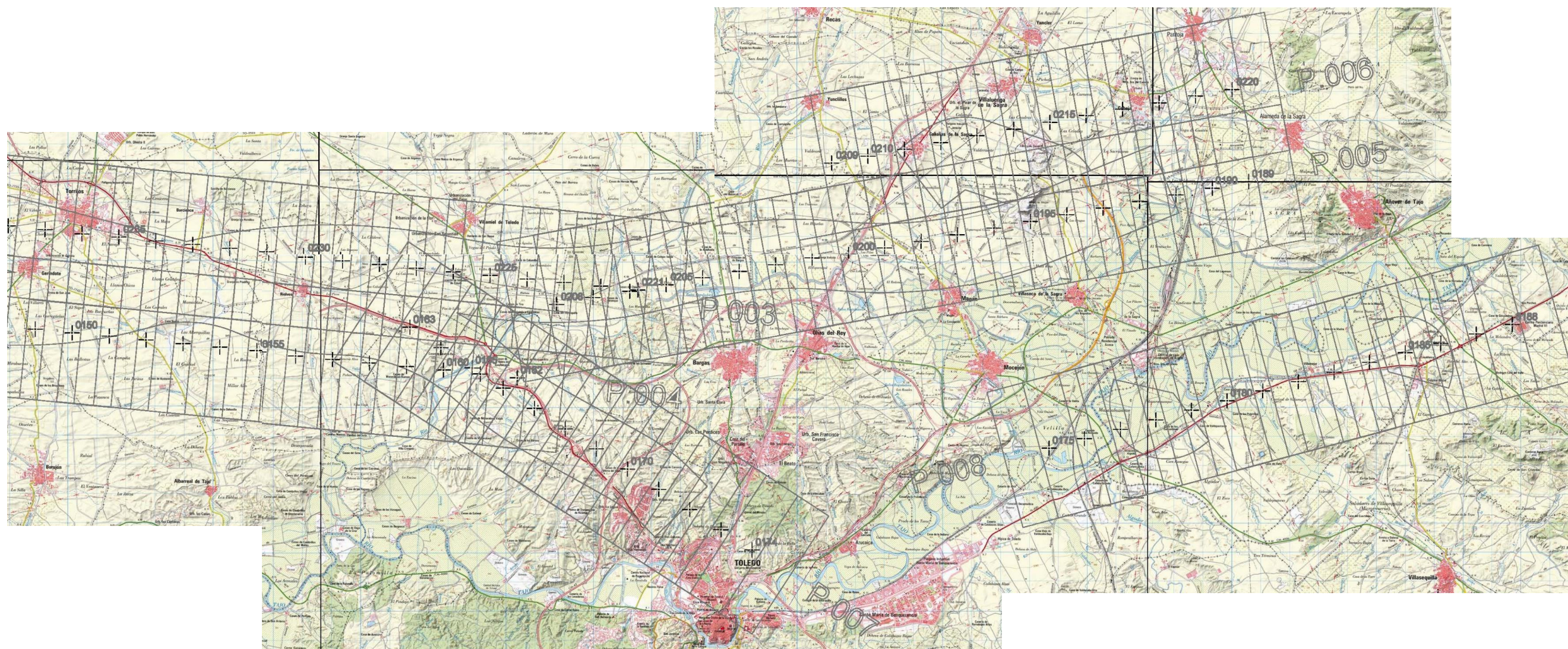
GRÁFICO DE VUELO

Ref.: 19/0060. 3 de 3.

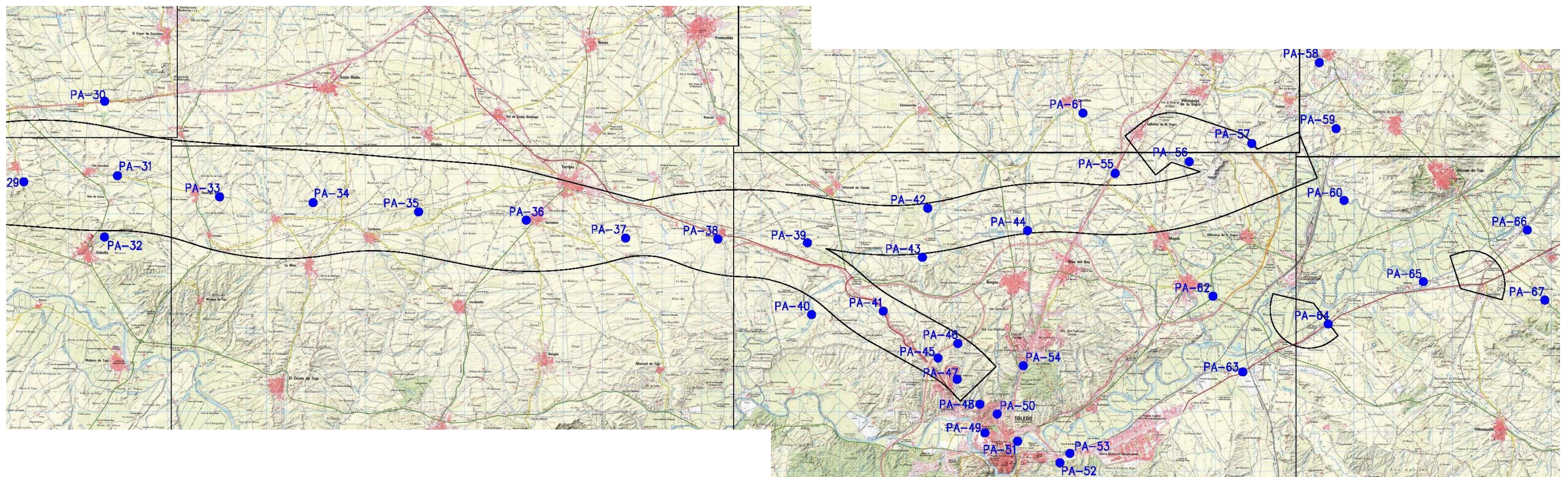
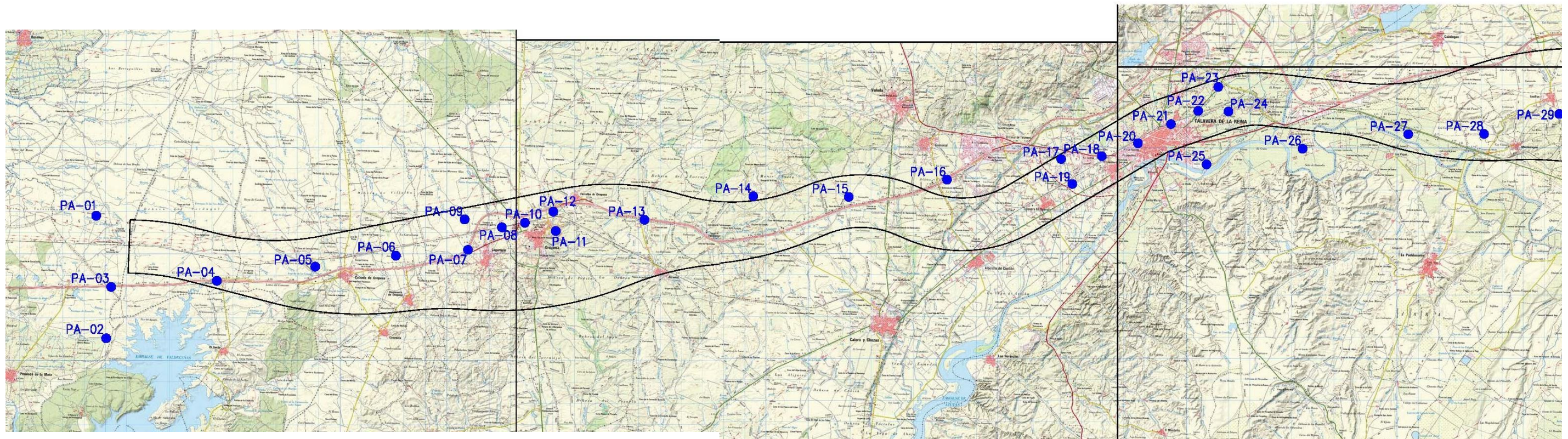
Cliente:	Geo 360				
Zona/s:	Toledo				
Provincia/s:	Toledo		H.M.N.:	629	
Resolución:	9 CM		Recubrimientos Long. y Transv.:	60 % y 30%	
Cámara/s:	Ultra CAM Eagle 80			Focal/es:	79.8
Avión/es:	Cessna 421				
Fecha/s de vuelo:	12/07/2019				
Sistema geográfico de referencia del gráfico:	Etrs89	Huso/s del gráfico:	30	Escala gráfico:	1:50.000







9. APÉNDICE 3: PUNTOS DE APOYO. GRÁFICO DE DISTRIBUCIÓN



10. APÉNDICE 4: PUNTOS DE APOYO. LISTADO DE COORDENADAS

Apoyo Oropesa			
Numero	X	Y	Z
PA-07	311011.506	4420198.126	359.695
PA-08	312597.826	4421257.064	354.722
PA-09	310851.499	4421629.552	352.874
PA-10	313672.953	4421470.230	356.539
PA-11	315122.815	4421082.405	396.705
PA-12	315004.444	4421993.371	359.142

Apoyo Talavera			
Numero	X	Y	Z
PA-17	339043.188	4424483.409	373.868
PA-18	340973.464	4424618.719	369.243
PA-19	339569.934	4423298.136	365.688
PA-20	342689.588	4425235.008	368.210
PA-21	344262.712	4426145.418	370.194
PA-22	345556.599	4426774.267	374.307
PA-23	346511.233	4427916.342	373.788
PA-24	346996.023	4426747.434	371.888


Apoyo Toledo			
Numero	X	Y	Z
PA-45	408974.995	4417723.742	566.743
PA-46	409983.754	4418458.473	563.135
PA-47	409949.657	4416653.369	505.402
PA-48	411096.757	4415391.392	515.912
PA-49	411348.692	4413943.084	451.184
PA-50	411974.180	4414900.866	516.297
PA-51	413003.221	4413522.194	458.509
PA-52	415142.301	4412438.135	489.362
PA-53	415653.258	4412912.794	464.855

Apoyo Oropesa-Toledo			
Numero	X	Y	Z
PA-01	293583.347	4421802.099	286.197
PA-02	294053.023	4416049.439	316.792
PA-03	294287.412	4418459.549	307.634
PA-04	299237.088	4418741.625	319.616
PA-05	303849.159	4419408.832	330.684
PA-06	307626.909	4419926.916	353.180
PA-07	311011.506	4420198.126	359.695
PA-08	312597.826	4421257.064	354.722
PA-09	310851.499	4421629.552	352.874
PA-10	313672.953	4421470.230	356.539
PA-11	315122.815	4421082.405	396.705
PA-12	315004.444	4421993.371	359.142
PA-13	319275.902	4421609.334	360.737
PA-14	324395.414	4422714.815	395.051
PA-15	328941.101	4422679.876	406.848
PA-16	333612.430	4423504.001	404.267
PA-17	339043.188	4424483.409	373.868
PA-18	340973.464	4424618.719	369.243
PA-19	339569.934	4423298.136	365.688
PA-20	342689.588	4425235.008	368.210
PA-21	344262.712	4426145.418	370.194
PA-22	345556.599	4426774.267	374.307
PA-23	346511.233	4427916.342	373.788
PA-24	346996.023	4426747.434	371.888
PA-25	345954.268	4424229.715	367.927
PA-26	350521.067	4424973.017	372.120
PA-27	355546.962	4425664.369	378.251
PA-28	359149.951	4425676.525	398.713
PA-29	362722.012	4426626.732	488.920
PA-30	366812.924	4430696.015	470.044
PA-31	367464.967	4426932.788	474.144
PA-32	366806.513	4423831.794	450.221
PA-33	372631.973	4425862.248	515.671
PA-34	377357.957	4425572.332	554.235
PA-35	382697.816	4425104.305	564.783
PA-36	388143.265	4424685.962	546.900
PA-37	393168.970	4423780.340	506.934
PA-38	397834.456	4423730.133	492.877
PA-39	402374.281	4423542.739	505.856
PA-40	402586.638	4419919.248	445.849
PA-41	406211.337	4420096.395	558.898
PA-42	408459.115	4425291.713	483.633

Apoyo Oropesa-Toledo			
Numero	X	Y	Z
PA-43	408189.388	4422811.800	466.891
PA-44	413504.804	4424156.020	520.294
PA-45	408974.995	4417723.742	566.743
PA-46	409983.754	4418458.473	563.135
PA-47	409949.657	4416653.369	505.402
PA-48	411096.757	4415391.392	515.912
PA-49	411348.692	4413943.084	451.184
PA-50	411974.180	4414900.866	516.297
PA-51	413003.221	4413522.194	458.509
PA-52	415142.301	4412438.135	489.362
PA-53	415653.258	4412912.794	464.855
PA-54	413295.541	4417334.178	540.699
PA-55	417940.940	4427053.436	507.479
PA-56	421687.260	4427640.850	529.606
PA-57	424852.065	4428563.147	528.205
PA-58	428273.614	4432645.128	508.307
PA-59	429117.041	4429310.322	516.859
PA-60	429518.026	4425684.244	487.144
PA-61	416310.381	4430094.363	541.745
PA-62	422890.059	4420849.659	478.645
PA-63	424399.303	4417022.752	486.479
PA-64	428719.523	4419443.255	474.198
PA-65	433532.760	4421579.803	478.450
PA-66	439676.748	4420647.354	583.334
PA-67	438787.345	4424195.512	504.232

11. APÉNDICE 5: PUNTOS DE APOYO. RESEÑAS


X: 293583.347Y: 4421802.099Z: 286.197



Punto de apoyo	Descripción: Centro zapata de torre Cota arriba
----------------	--




X: 299237.088Y: 4418741.625Z: 319.616



Punto de apoyo	Descripción: Esquina línea blanca Cota suelo
----------------	---




X: 294053.023Y: 4416049.439Z: 316.792



Punto de apoyo	Descripción: Esquina camino Cota suelo
----------------	---




X: 303849.159Y: 4419408.832Z: 330.684



Punto de apoyo	Descripción: Esquina camibo Cota suelo
----------------	---



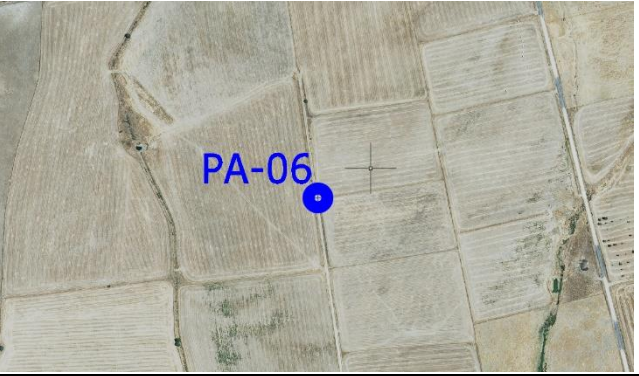
X: 294287.412Y: 4418459.549Z: 307.634



Punto de apoyo	Descripción: Esquina losa Cota suelo
----------------	---

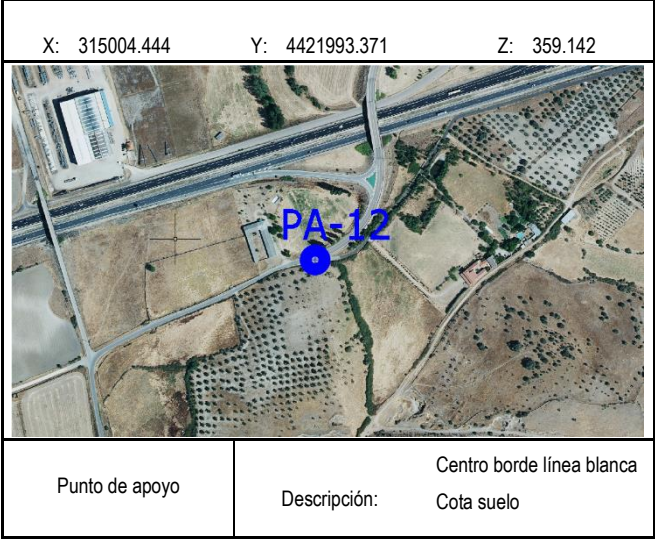
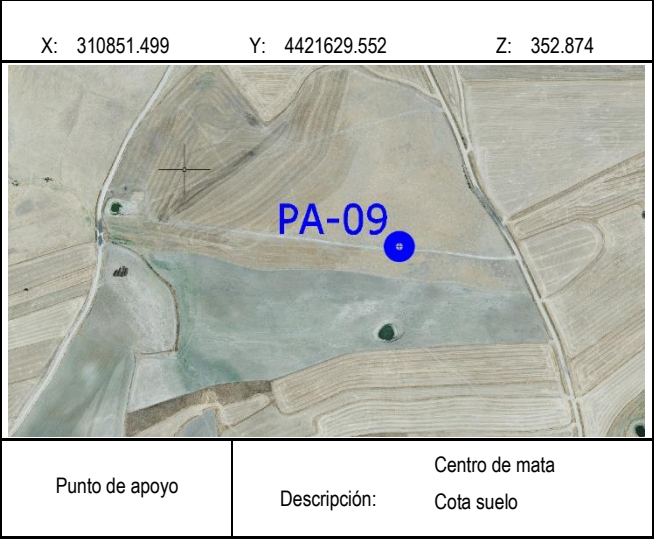
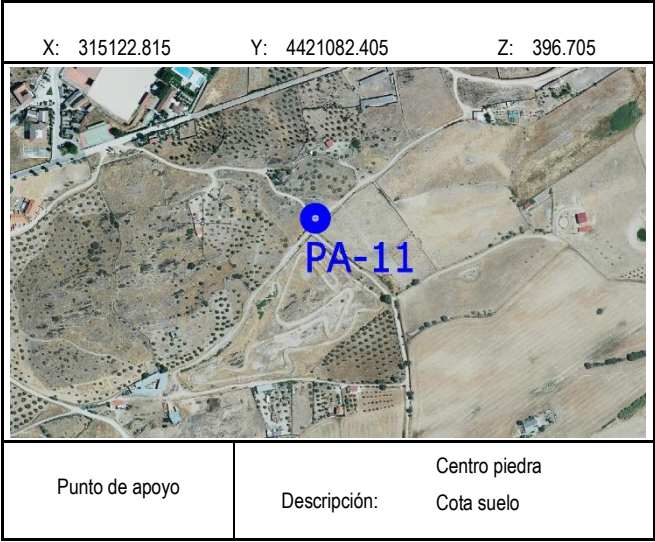
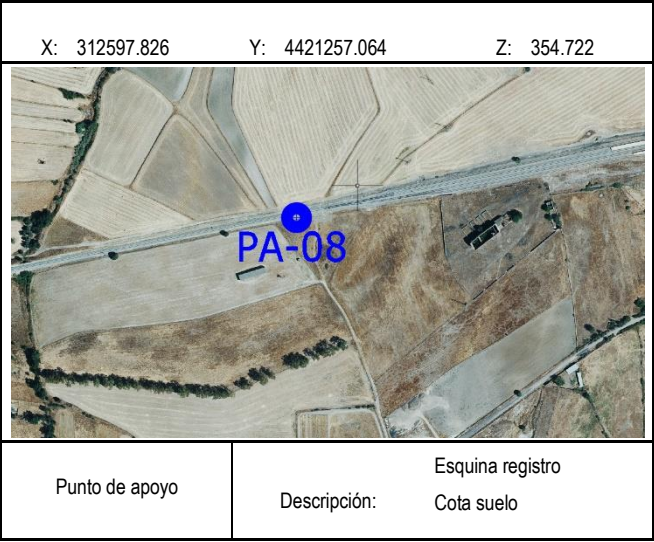
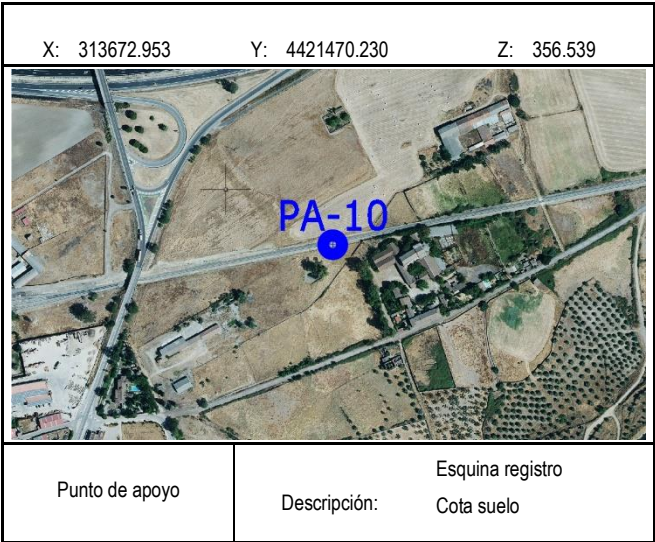
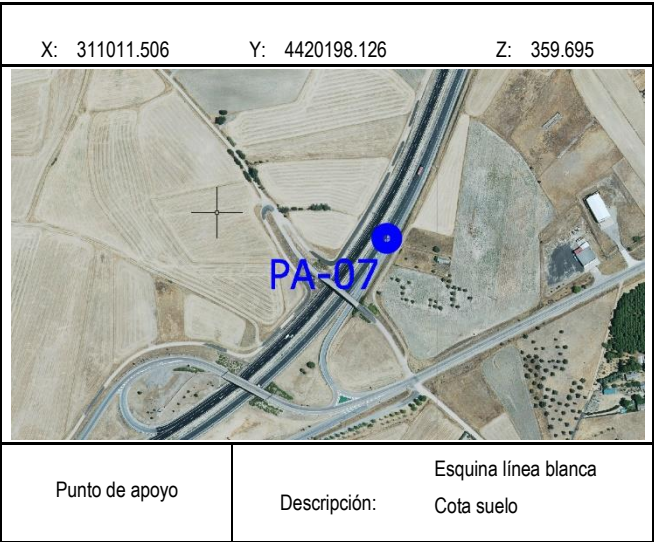


X: 307626.909Y: 4419926.916Z: 353.180

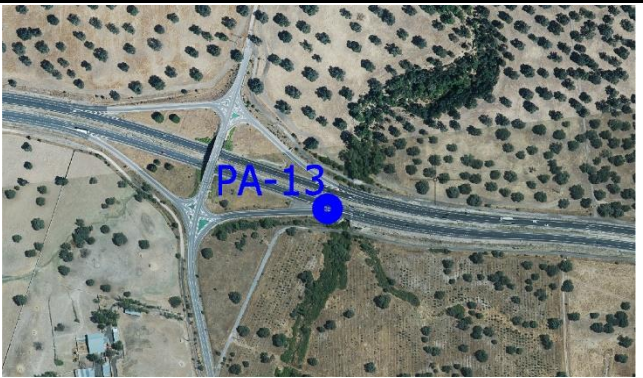


Punto de apoyo	Descripción: Esquina valla Cota suelo
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X: 319275.902Y: 4421609.334Z: 360.737




Punto de apoyo

Descripción:Esquina pinturaCota suelo



X: 333612.430Y: 4423504.001Z: 404.267

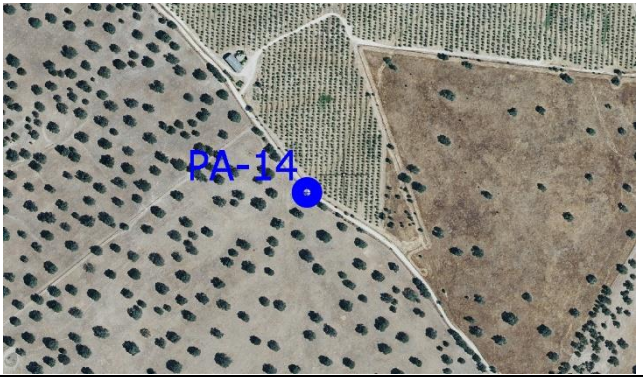


Punto de apoyo

Descripción:Centro borde línea blancaCota suelo



X: 324395.414Y: 4422714.815Z: 395.051




Punto de apoyo

Descripción:Esquina zapata torreCota suelo



X: 339043.188Y: 4424483.409Z: 373.868

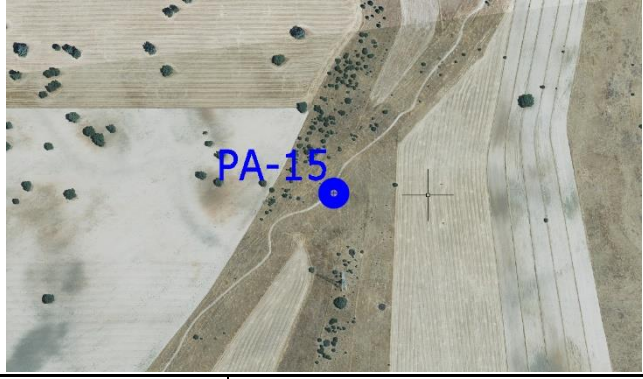


Punto de apoyo

Descripción:Esquina arquetaCota arriba



X: 328941.101Y: 4422679.876Z: 406.848




Punto de apoyo

Descripción:Centro mataCota suelo



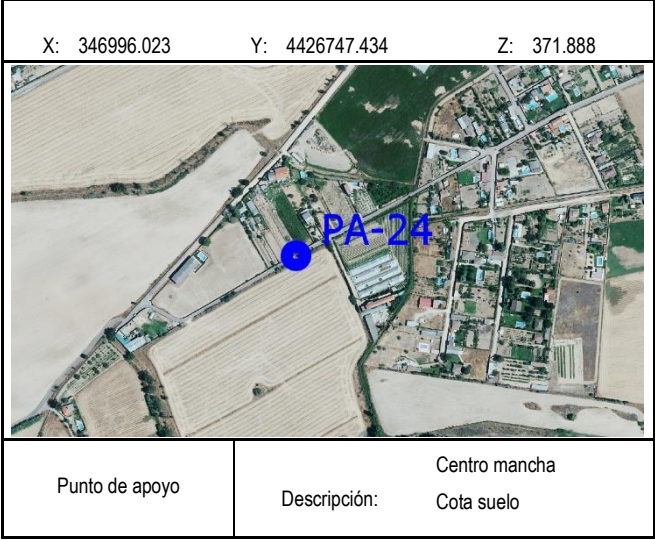
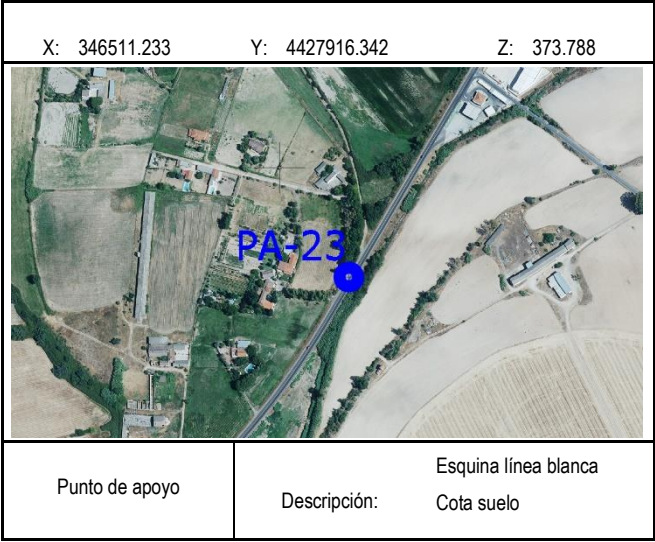
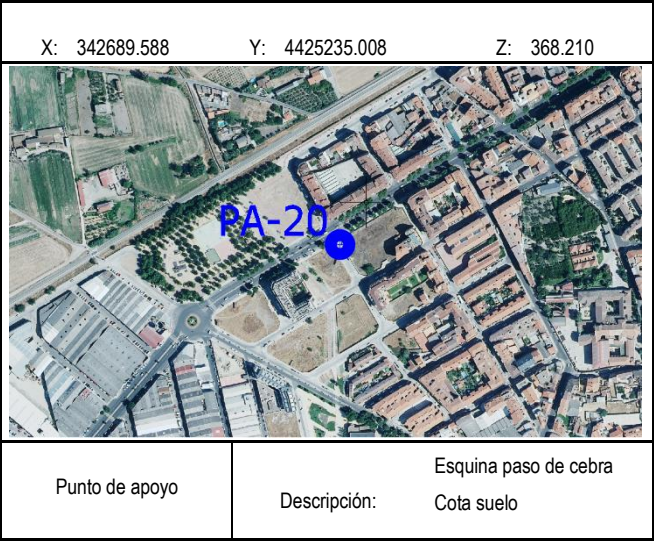
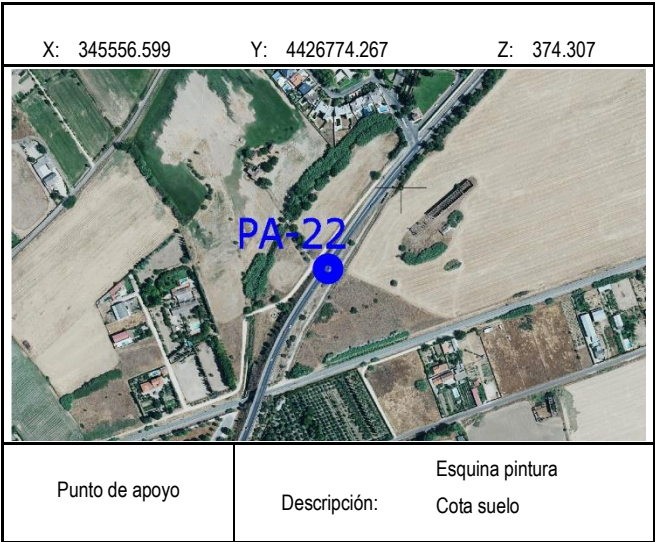
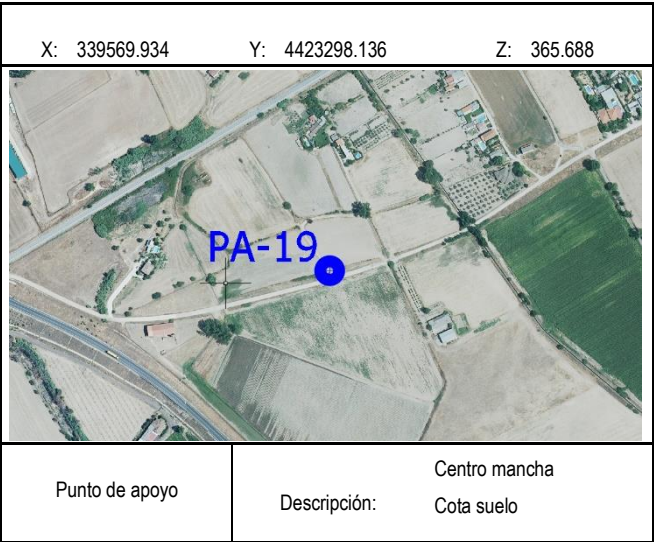
X: 340973.464Y: 4424618.719Z: 369.243



Punto de apoyo

Descripción:Centro borde línea blancaCota suelo





X: 345954.268Y: 4424229.715Z: 367.927

Punto de apoyo	Descripción: Esquina paso de cebra Cota suelo
----------------	--



X: 359149.951Y: 4425676.525Z: 398.713

Punto de apoyo	Descripción: Centro arbolito Cota suelo
----------------	--



X: 350521.067Y: 4424973.017Z: 372.120

Punto de apoyo	Descripción: Esquina pilar Cota suelo
----------------	--



X: 362722.012Y: 4426626.732Z: 488.920

Punto de apoyo	Descripción: Esquina camino Cota suelo
----------------	---



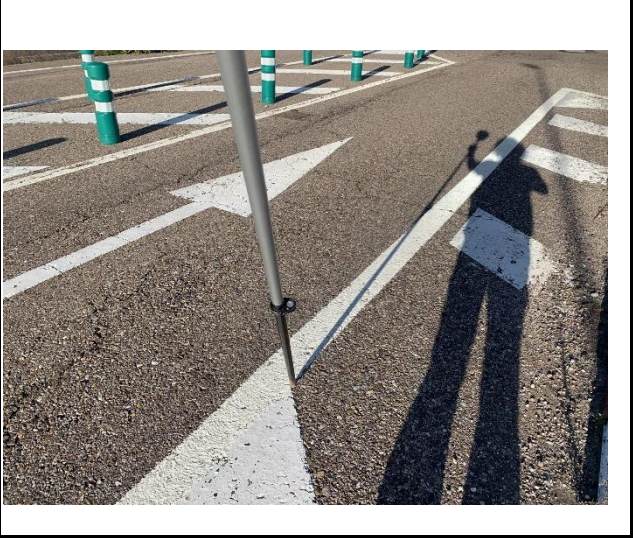
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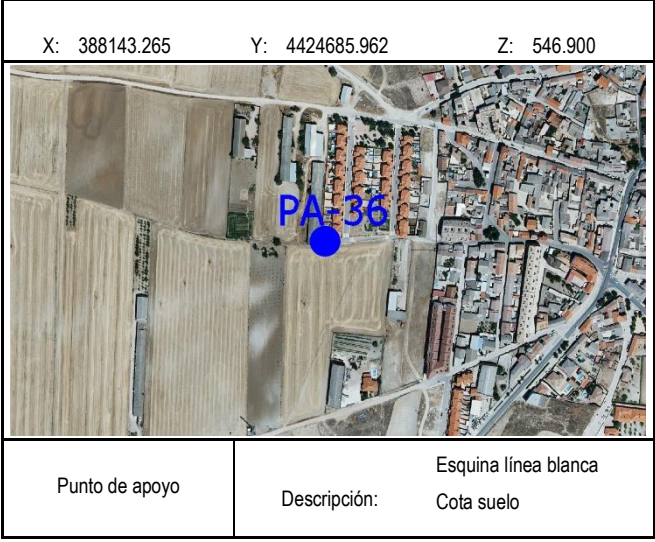
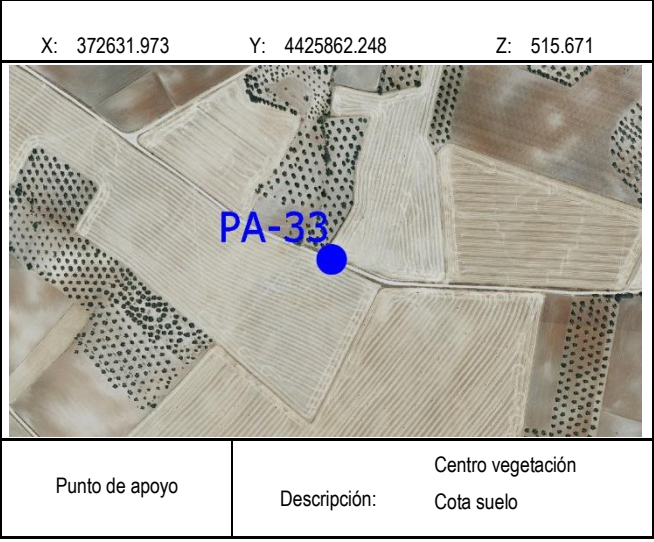
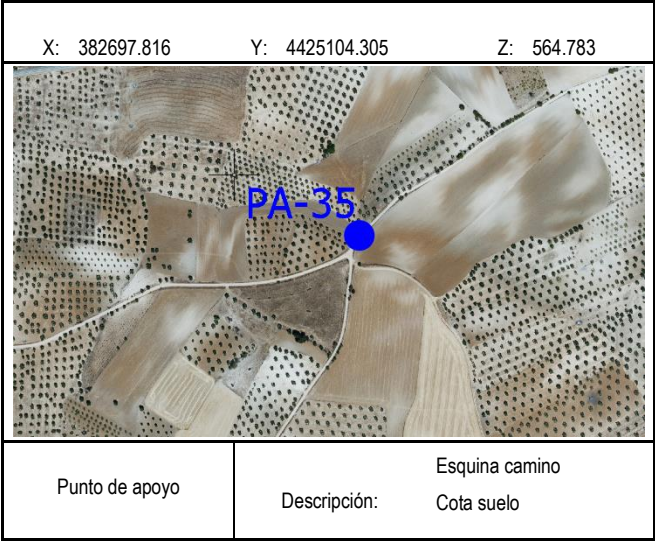
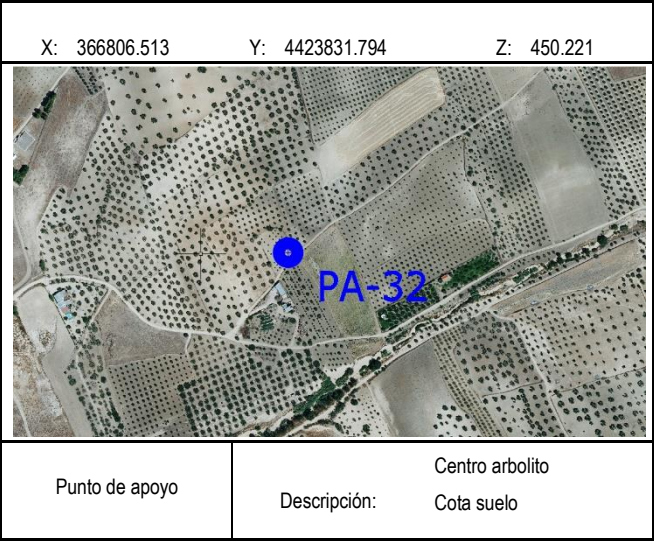
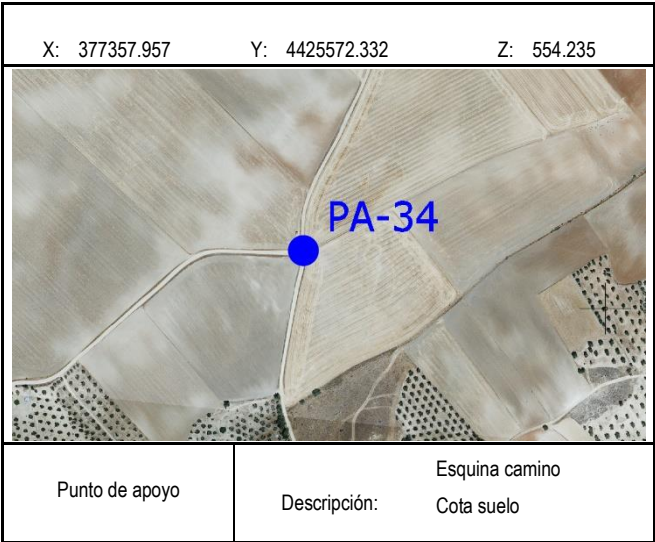
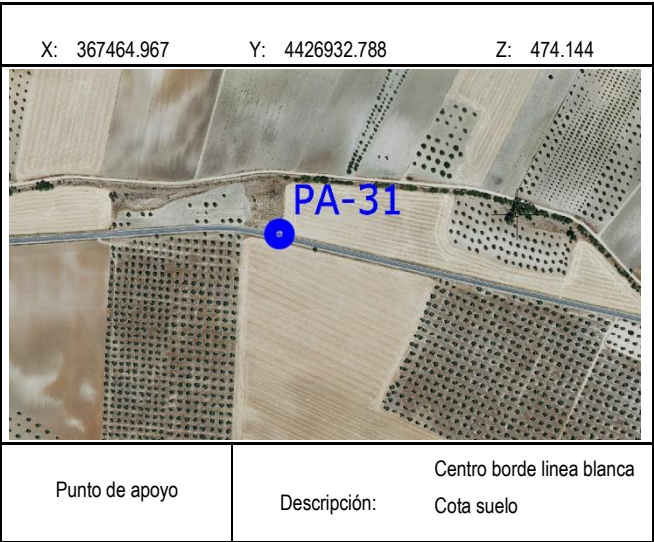
Punto de apoyo	Descripción: Esquina poste de hormigón Cota suelo
----------------	--




X: 366812.924Y: 4430696.015Z: 470.044

Punto de apoyo	Descripción: Esquina pintura Cota suelo
----------------	--






X: 393168.970Y: 4423780.340Z: 506.934



Punto de apoyo	Descripción: Centro mata Cota suelo
----------------	--




X: 402586.638Y: 4419919.248Z: 445.849



Punto de apoyo	Descripción: Centro mata Cota suelo
----------------	--




X: 397834.456Y: 4423730.133Z: 492.877



Punto de apoyo	Descripción: Centro registro Cota suelo
----------------	--



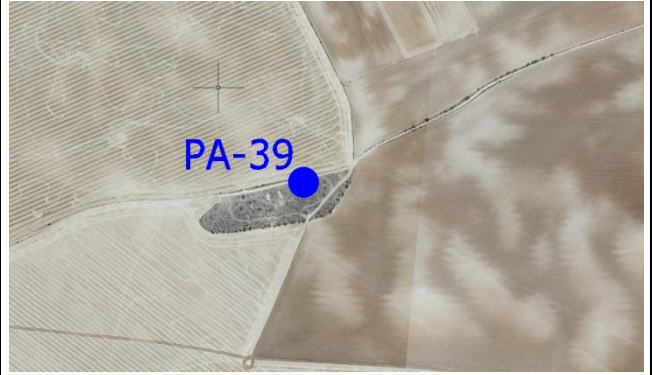
X: 406211.337Y: 4420096.395Z: 558.898



Punto de apoyo	Descripción: Centro fin flecha Cota suelo
----------------	--




X: 402374.281Y: 4423542.739Z: 505.856



Punto de apoyo	Descripción: Centro piedra Cota suelo
----------------	--

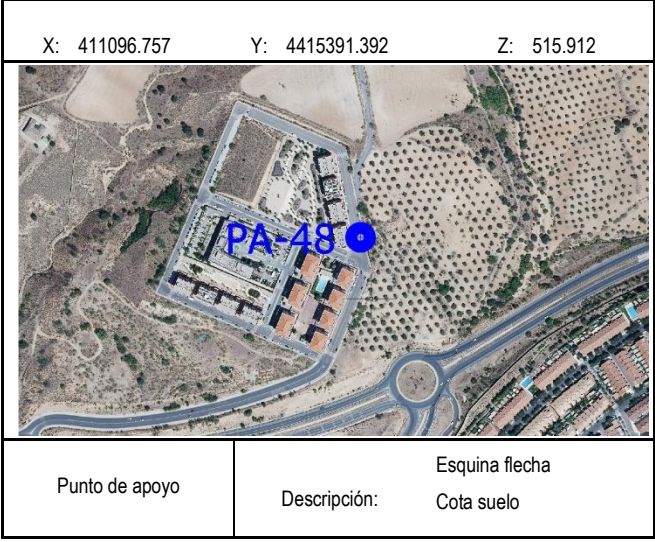
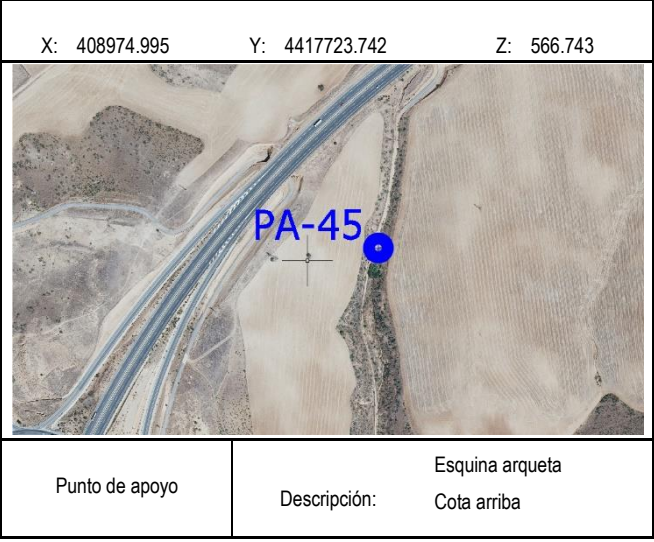
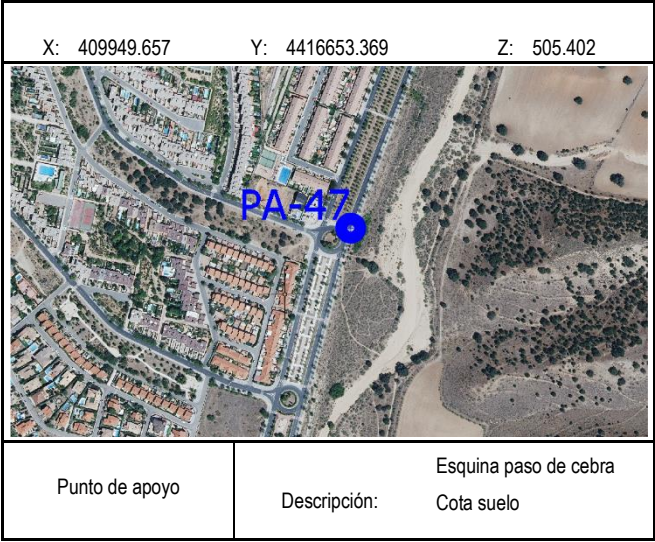
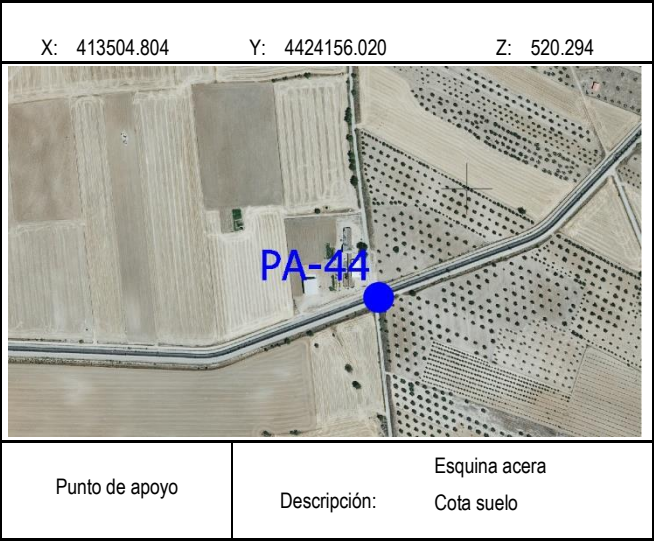
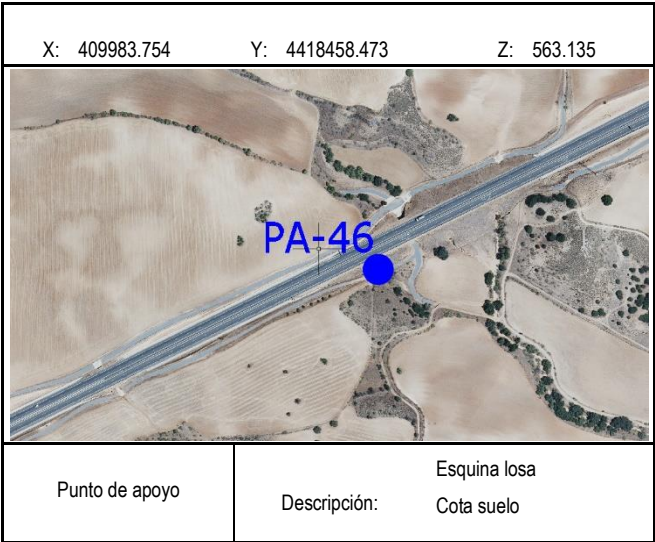
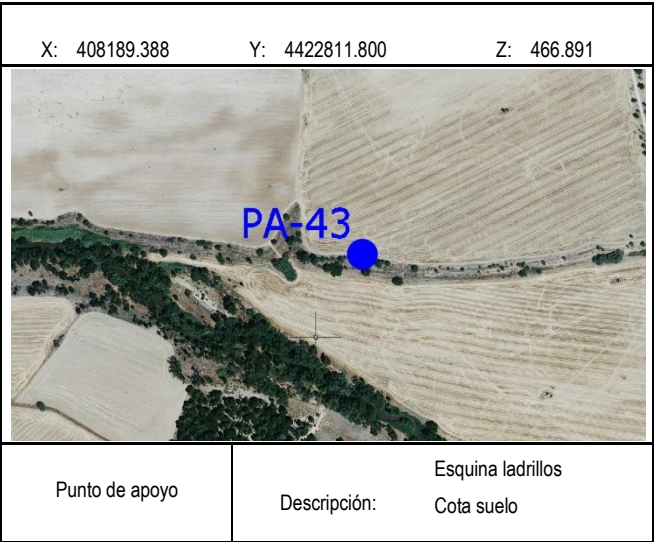


X: 408459.115Y: 4425291.713Z: 483.633




Punto de apoyo	Descripción: Centro mata Cota suelo
----------------	--





X: 411348.692Y: 4413943.084Z: 451.184




Punto de apoyo

Descripción:Centro registroCota suelo



X: 415142.301Y: 4412438.135Z: 489.362




Punto de apoyo

Descripción:Esquina pinturaCota suelo



X: 411974.180Y: 4414900.866Z: 516.297




Punto de apoyo

Descripción:Esquina pinturaCota suelo



X: 415653.258Y: 4412912.794Z: 464.855



Punto de apoyo

Descripción:Centro registroCota suelo

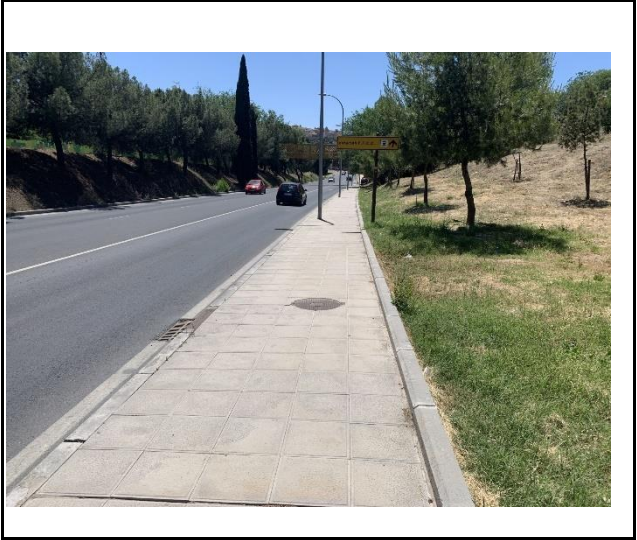


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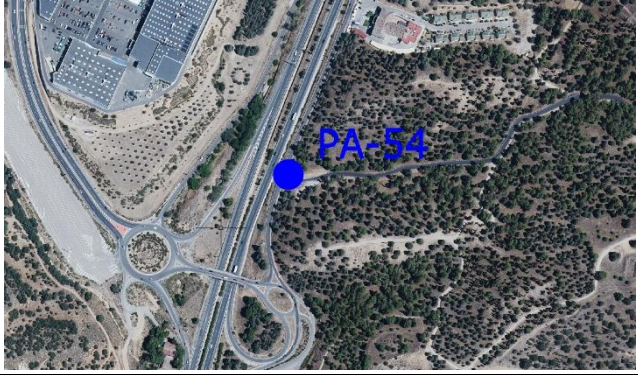


Punto de apoyo

Descripción:Centro registroCota suelo



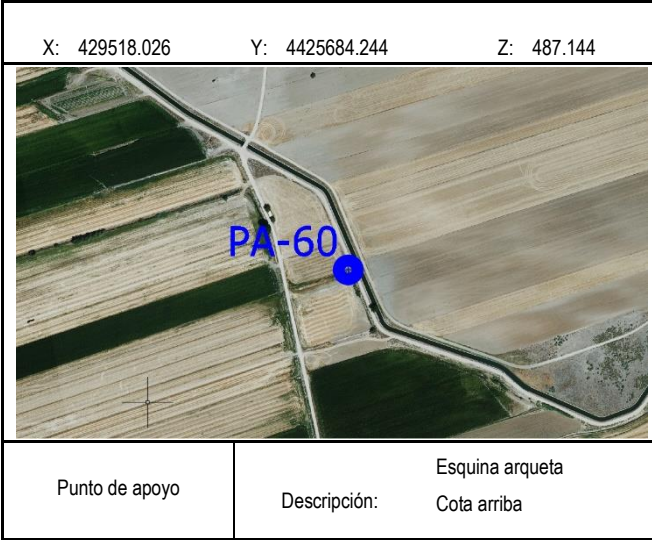
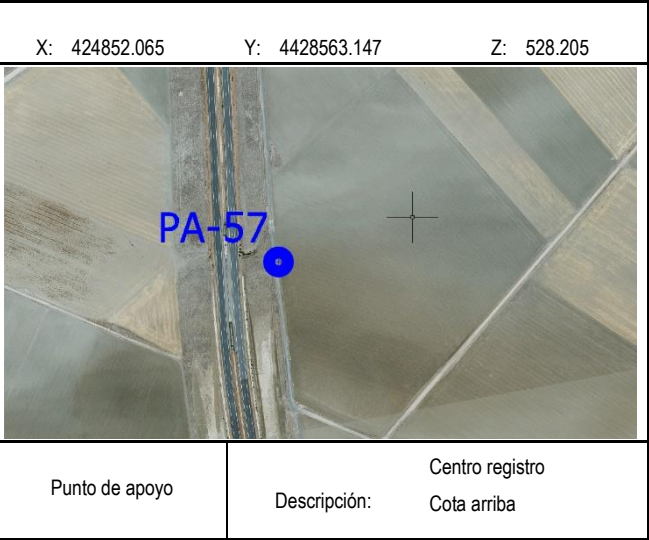
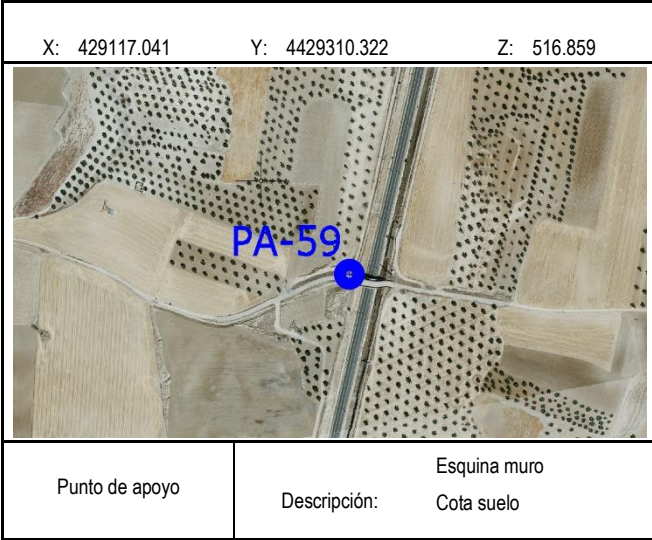
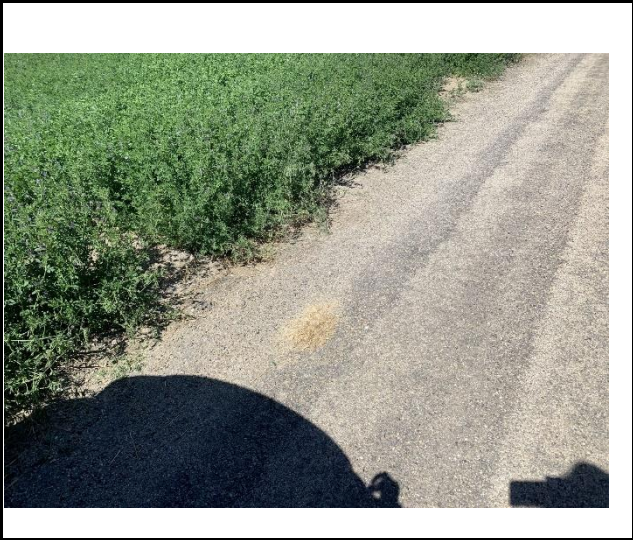
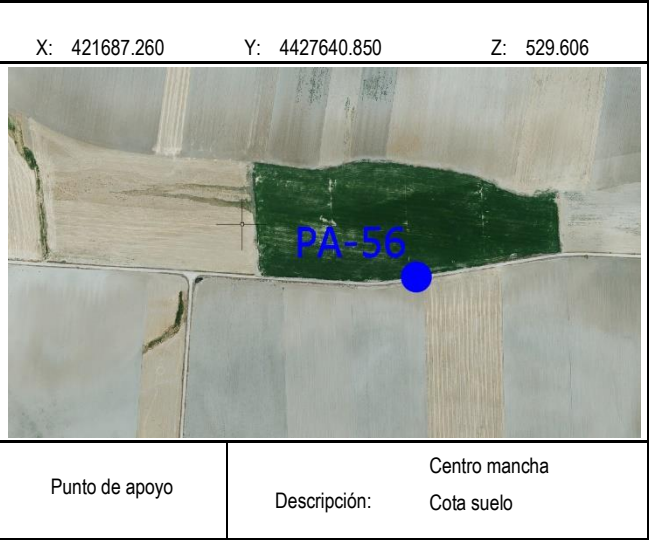
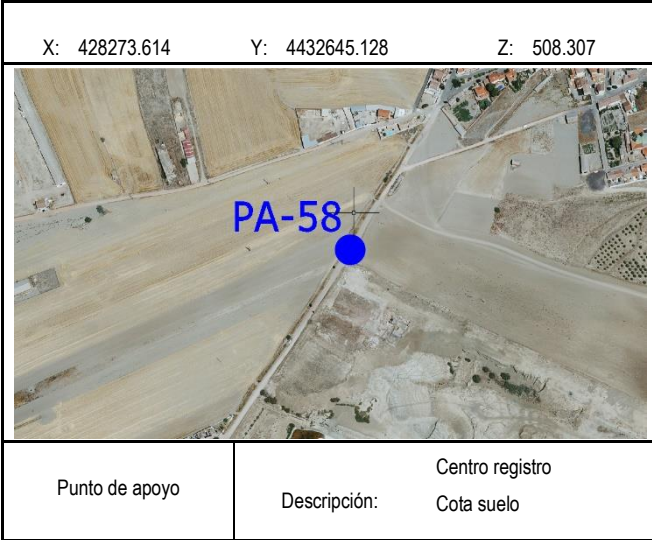
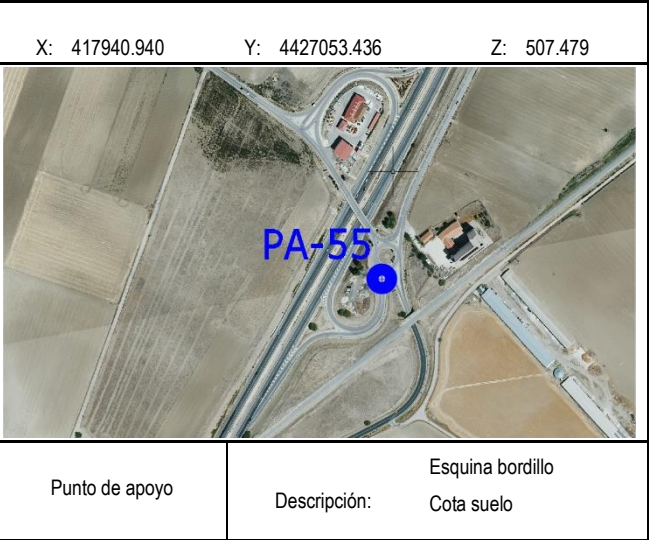
X: 413295.541Y: 4417334.178Z: 540.699




Punto de apoyo

Descripción:Centro borde pinturaCota suelo






X: 416310.381Y: 4430094.363Z: 541.745



Punto de apoyo	Descripción: Centro mata Cota suelo
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X: 428719.523Y: 4419443.255Z: 474.198



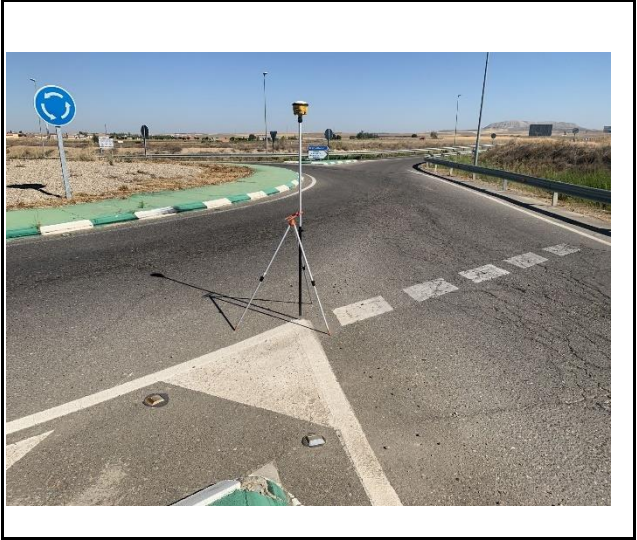
Punto de apoyo	Descripción: Centro borde línea blanca Cota suelo
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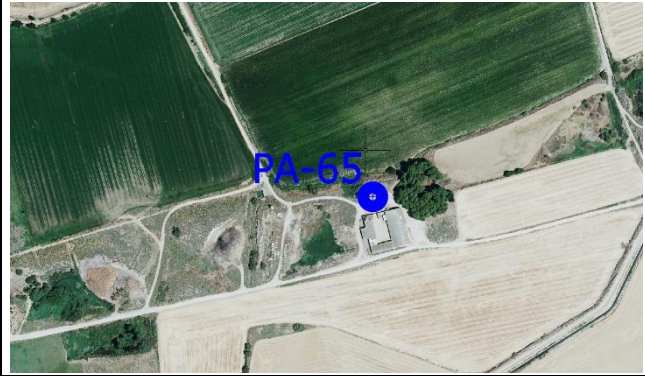
X: 422890.059Y: 4420849.659Z: 478.645



Punto de apoyo	Descripción: Esquina pintura Cota suelo
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X: 433532.760Y: 4421579.803Z: 478.450



Punto de apoyo	Descripción: Esquina losa Cota suelo
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X: 424399.303Y: 4417022.752Z: 486.479



Punto de apoyo	Descripción: Centro borde línea blanca Cota suelo
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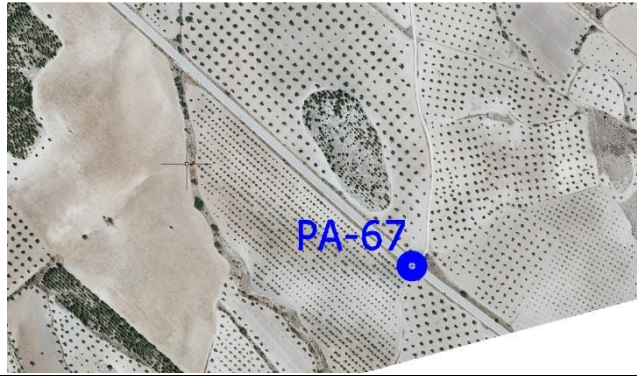


X: 439676.748Y: 4420647.354Z: 583.334



Punto de apoyo	Descripción: Centro borde línea blanca Cota suelo
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X: 438787.345 Y: 4424195.512 Z: 504.232		
		
Punto de apoyo	Descripción:	Esquina murete Cota suelo



12. APÉNDICE 6: AEROTRIANGULACIÓN

		IMU-Boresight	: OFF
<u>Aerotriangulación Oropesa</u>		Earth's curvature correction	: ON
		Atmospheric correction	: ON
Start Post Processing: Mon Aug 12 16:21:22 2019		Do not eliminate manual points	: OFF
=====		Do not eliminate GNSS	: ON
Active Block	: complete Block	Standard deviations (a-priori) :	
Number of photos	: 12	-----	
Number of strips	: 1	Ground control (planimetry) [m]	
Photo scale	: 1:17606	Set	
Mean terrain height [m]	: 355	0 (=default)	: 0.010
Automatic blunder detection	: OFF	Ground control (height) [m]	
Use all adjusted points in project file		Set	
as control (absolute mode)	: OFF	0 (=default)	: 0.015
Control parameter for block adjustment :		Automatic image points [mm]	
-----		Set	
Selfcalibration	: OFF	0 (=default)	: 0.001
GNSS-Mode	: ON	Image points of ground control and manual measurements [mm]	: 0.002
Drift-Mode	: ON	GNSS X Y Z [m]	: 0.100 0.100 0.100
drift per block	: ON only shifts are enabled	INS omega phi kappa [deg]	: 0.010 0.010 0.010
drift for X,Y,Z	: ON,ON,ON	Used Cameras in block:	
IMU-Mode	: ON	-----	

1 Eagle			number of unknowns	1161
Distortion		: No correction	redundancy	931
Tie Point Generator			RMS automatic points in photo (number: 984)	
-----			x	0.2 micron
created 34 observations for photo	01		y	0.3 micron
created 74 observations for photo	02		RMS control and manual points in photo (number: 17)	
created 84 observations for photo	03		x	0.8 micron
created 82 observations for photo	04		y	1.0 micron
created 91 observations for photo	05		RMS control points with default standard deviation set (number: 6)	
created 109 observations for photo	06		x	0.002 [meter]
created 106 observations for photo	07		y	0.002 [meter]
created 95 observations for photo	08		RMS control points with default standard deviation set (number: 6)	
created 89 observations for photo	09		z	0.002 [meter]
created 103 observations for photo	10		RMS IMU observations (number: 12)	
created 82 observations for photo	11		omega	0.002 [deg]
created 52 observations for photo	12		phi	0.002 [deg]
total of 1001 measurements in 12 photos are used for adjustment (total 12 photos)			kappa	0.002 [deg]
sigma naught	1.9 micron (16:21:23)		RMS GNSS observations (number: 12)	
sigma naught	0.4 micron (16:21:23)		x	0.024 [meter]
found 82 points connecting 2 photos			y	0.012 [meter]
found 279 points connecting 3 photos			z	0.031 [meter]
number of observations	2092		sigma naught	0.4 micron (16:21:23)

standard deviations of exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg/1000])

photo ID	px	py	pz	omega	phi	kappa
01	0.027	0.029	0.016	1.04472	1.13011	0.59086
02	0.021	0.025	0.013	0.94148	0.86005	0.39236
03	0.018	0.024	0.012	0.92001	0.69666	0.30116
04	0.016	0.024	0.012	0.90388	0.61427	0.26615
05	0.016	0.023	0.012	0.88605	0.61881	0.25875
06	0.016	0.023	0.013	0.86728	0.60630	0.25298
07	0.017	0.023	0.013	0.85538	0.62184	0.25303
08	0.016	0.023	0.012	0.84937	0.60011	0.25834
09	0.017	0.024	0.011	0.85609	0.66114	0.26048
10	0.018	0.024	0.010	0.80938	0.69300	0.28360
11	0.020	0.025	0.010	0.85365	0.82256	0.32253
12	0.025	0.027	0.013	0.86023	1.02686	0.45232

mean standard deviations of rotations

omega 0.9 [deg/1000]

phi 0.7 [deg/1000]

kappa 0.3 [deg/1000]

max standard deviations of rotations

omega 1.0 [deg/1000] at photo 01

phi 1.1 [deg/1000] at photo 01

kappa 0.6 [deg/1000] at photo 01

mean standard deviations of translations

x 0.019 [meter]

y 0.024 [meter]

z 0.012 [meter]

max standard deviations of translations

x 0.027 [meter] at photo 01

y 0.029 [meter] at photo 01

z 0.016 [meter] at photo 01

residuals horizontal control points in [meter]

control point ID	rx	ry
PA-07	0.002	-0.001
PA-08	-0.004	0.001
PA-09	-0.000	-0.000
PA-10	0.003	0.003
PA-11	-0.001	-0.000
PA-12	0.000	-0.003

residuals vertical control points in [meter]

control point ID	rz
PA-07	0.003
PA-08	-0.002

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PA-09	-0.000					linear	part in [meter]	X	-0.000	Y	-0.000	Z	-0.000
PA-10	-0.001					01	-0.032		-0.016		-0.054		
PA-11	0.000					02	-0.021		-0.000		-0.033		
PA-12	-0.001					03	0.006		-0.016		-0.038		
residuals IMU observations in [deg]						04	-0.022		-0.019		-0.015		
photo ID	omega	phi	kappa			05	0.030		0.007		-0.003		
01	-0.000	0.002	0.001			06	0.008		0.024		0.017		
02	0.000	0.003	0.003			07	-0.001		0.011		0.012		
03	-0.000	0.002	0.003			08	-0.049		0.015		-0.001		
04	0.000	0.004	0.002			09	0.022		0.002		-0.002		
05	0.001	0.002	0.002			10	0.015		-0.001		0.019		
06	0.002	0.003	0.002			11	0.012		-0.001		0.040		
07	0.002	0.003	0.003			12	0.032		-0.006		0.057		
08	0.002	0.004	0.003			max standard deviations of terrain points							
09	0.002	0.002	0.003			x	0.015 [meter]	at point	20000016				
10	0.002	0.002	0.003			y	0.026 [meter]	at point	20000030				
11	0.003	0.001	0.002			z	0.043 [meter]	at point	20000030				
12	0.003	0.001	0.002			mean standard deviations of terrain points							
residuals GNSS observations in [meter]						x	0.008						
photo ID	rx	ry	rz			y	0.011						
GNSS drift parameter for profile 1						z	0.024						
constant part in [meter]	X	0.042	Y	0.004	Z	0.339	exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg])						

rotations from terrain to photo (rotated axes)

photo ID	px	py	pz	omega	phi	kappa
01	315465.925	4421830.257	1765.359	-0.13174	0.27868	-168.54047
02	315018.045	4421741.694	1756.219	-0.20095	0.31392	-168.55346
03	314572.969	4421649.095	1757.387	-0.21129	0.26889	-168.61420
04	314119.854	4421556.556	1762.903	-0.21311	0.26354	-168.62479
05	313667.623	4421471.239	1756.499	-0.18188	0.31881	-168.61737
06	313214.803	4421390.480	1760.091	-0.12208	0.28499	-168.55424
07	312769.679	4421304.586	1762.880	-0.18784	0.25808	-168.49714
08	312318.603	4421209.957	1757.880	-0.23635	0.26572	-168.59717
09	311865.856	4421116.826	1756.673	-0.18725	0.30376	-168.65976
10	311414.424	4421031.213	1760.431	-0.16571	0.29955	-168.52228
11	310968.164	4420940.431	1763.223	-0.26309	0.25283	-168.61196
12	310514.757	4420849.919	1760.051	-0.14720	0.29705	-168.62733

=====

Sigma naught : 0.4 [micron] = 0.1 [pixel in level 0]

Aerotriangulación Talavera

Start Post Processing: Mon Aug 12 17:13:56 2019

=====

Active Block : complete Block

Number of photos : 21

Number of strips : 1

Photo scale : 1:17315

Mean terrain height [m] : 370

Automatic blunder detection : OFF

Use all adjusted points in project file

as control (absolute mode) : OFF

Control parameter for block adjustment :

Selfcalibration : OFF

GNSS-Mode : ON

Drift-Mode : ON

drift per block : ON only shifts are enabled

drift for X,Y,Z : ON,ON,ON

IMU-Mode : ON

IMU-Boresight : OFF

Earth's curvature correction	: ON	Tie Point Generator		
Atmospheric correction	: ON	-----		
Do not eliminate manual points	: OFF	created	58 observations for photo	13
Do not eliminate GNSS	: ON	created	100 observations for photo	14
Standard deviations (a-priori) :		created	104 observations for photo	15
-----		created	98 observations for photo	16
Ground control (planimetry) [m]		created	104 observations for photo	17
Set		created	118 observations for photo	18
0 (=default)	: 0.010	created	115 observations for photo	19
Ground control (height) [m]		created	99 observations for photo	20
Set		created	85 observations for photo	21
0 (=default)	: 0.014	created	84 observations for photo	22
Automatic image points [mm]		created	85 observations for photo	23
Set		created	94 observations for photo	24
0 (=default)	: 0.001	created	84 observations for photo	25
Image points of ground control and manual measurements [mm]	: 0.002	created	74 observations for photo	26
GNSS	X Y Z [m] : 0.100 0.100 0.100	created	75 observations for photo	27
INS	omega phi kappa [deg] : 0.010 0.010 0.010	created	95 observations for photo	28
Used Cameras in block:		created	117 observations for photo	29
-----		created	130 observations for photo	30
1 Eagle		created	105 observations for photo	31
Distortion	: No correction	created	80 observations for photo	32

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created	39 observations for photo	33			omega	0.002 [deg]			
total of 1943 measurements in 21 photos are used for adjustment (total 21 photos)					phi	0.005 [deg]			
sigma naught	1.9 micron (17:13:56)				kappa	0.002 [deg]			
sigma naught	0.4 micron (17:13:57)				RMS GNSS observations (number: 21)				
found	202 points connecting	2 photos			x	0.034 [meter]			
found	513 points connecting	3 photos			y	0.028 [meter]			
number of observations	4036				z	0.019 [meter]			
number of unknowns	2277				sigma naught	0.4 micron (17:13:57)			
redundancy	1759				standard deviations of exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg/1000])				
RMS automatic points in photo (number: 1919)					photo ID	px	py	pz	omega phi kappa
x	0.2 micron				13	0.030	0.028	0.016	0.95720 1.22540 0.55589
y	0.4 micron				14	0.022	0.025	0.011	0.92365 0.89539 0.40518
RMS control and manual points in photo (number: 24)					15	0.019	0.024	0.011	0.90203 0.75285 0.34245
x	0.9 micron				16	0.019	0.023	0.012	0.89655 0.70211 0.30514
y	0.8 micron				17	0.020	0.022	0.013	0.88831 0.72855 0.30931
RMS control points with default standard deviation set (number: 8)					18	0.018	0.022	0.014	0.90751 0.67567 0.32383
x	0.005 [meter]				19	0.018	0.023	0.014	0.93033 0.69380 0.32041
y	0.002 [meter]				20	0.020	0.023	0.015	0.96889 0.72685 0.30810
RMS control points with default standard deviation set (number: 8)					21	0.020	0.023	0.015	0.95576 0.73971 0.36391
z	0.003 [meter]				22	0.022	0.023	0.015	0.96369 0.84400 0.36200
RMS IMU observations (number: 21)					23	0.021	0.023	0.015	0.94484 0.81206 0.34821

24	0.020	0.022	0.015	0.93961	0.76882	0.32803	max standard deviations of translations		
25	0.020	0.023	0.015	0.94914	0.75846	0.32832	x	0.031 [meter] at photo	33
26	0.021	0.023	0.014	0.96856	0.82192	0.34370	y	0.028 [meter] at photo	33
27	0.021	0.023	0.014	0.92718	0.77254	0.33642	z	0.016 [meter] at photo	13
28	0.020	0.023	0.014	0.92636	0.75943	0.30098	residuals horizontal control points in [meter]		
29	0.018	0.022	0.012	0.86986	0.66634	0.31130	control point ID	rx	ry
30	0.017	0.022	0.011	0.86413	0.64370	0.29960	PA-17	0.001	0.002
31	0.018	0.023	0.011	0.87544	0.70835	0.32022	PA-18	-0.003	-0.002
32	0.022	0.025	0.011	0.91016	0.88168	0.41128	PA-19	-0.001	0.001
33	0.031	0.028	0.015	0.98788	1.23905	0.59787	PA-20	-0.000	0.002
mean standard deviations of rotations							PA-21	-0.004	-0.003
omega	0.9 [deg/1000]						PA-22	0.012	-0.003
phi	0.8 [deg/1000]						PA-23	-0.000	0.001
kappa	0.4 [deg/1000]						PA-24	-0.006	0.002
max standard deviations of rotations							residuals vertical control points in [meter]		
omega	1.0 [deg/1000] at photo 33						control point ID	rz	
phi	1.2 [deg/1000] at photo 33						PA-17	0.003	
kappa	0.6 [deg/1000] at photo 33						PA-18	-0.001	
mean standard deviations of translations							PA-19	-0.003	
x	0.021 [meter]						PA-20	-0.001	
y	0.023 [meter]						PA-21	0.001	
z	0.013 [meter]						PA-22	0.001	

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PA-23	0.003			30	-0.003	-0.006	-0.000
PA-24	-0.004			31	-0.002	-0.006	-0.000
residuals IMU observations in [deg]				32	-0.002	-0.006	-0.001
photo ID	omega	phi	kappa	33	-0.003	-0.004	-0.001
13	0.000	-0.005	0.003	residuals GNSS observations in [meter]			
14	-0.001	-0.005	0.002	photo ID	rx	ry	rz
15	-0.002	-0.004	0.002	GNSS drift parameter for profile 1			
16	-0.002	-0.004	0.003	constant part in [meter] X -0.079 Y 0.048 Z 0.299			
17	-0.001	-0.003	0.003	linear part in [meter] X -0.000 Y 0.000 Z -0.000			
18	0.001	-0.007	0.003	13	0.043	0.063	-0.030
19	-0.000	-0.005	0.003	14	0.000	0.055	-0.024
20	-0.001	-0.005	0.002	15	-0.053	0.020	-0.005
21	-0.002	-0.006	0.001	16	-0.051	0.009	0.015
22	-0.003	-0.005	0.002	17	-0.047	0.020	0.021
23	-0.002	-0.007	0.003	18	0.007	0.024	0.032
24	-0.003	-0.005	0.003	19	-0.021	0.012	-0.005
25	-0.002	-0.004	0.003	20	-0.016	-0.005	-0.006
26	-0.001	-0.005	0.002	21	0.015	-0.011	-0.008
27	-0.000	-0.004	0.001	22	-0.009	-0.052	-0.014
28	-0.000	-0.005	0.001	23	0.030	-0.021	-0.021
29	-0.003	-0.006	-0.000	24	0.005	-0.042	-0.027

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25	-0.032	-0.012	-0.017	15	339714.540	4424003.301	1751.083	0.23470	-0.22725	25.63333
26	0.033	-0.008	-0.008	16	340137.761	4424192.392	1750.251	0.19049	-0.26546	25.76599
27	0.020	0.016	-0.004	17	340556.999	4424380.715	1751.251	0.26186	-0.21618	25.78865
28	0.040	0.011	-0.003	18	340973.620	4424575.590	1751.792	0.23973	-0.22391	25.80141
29	0.044	-0.020	0.013	19	341385.403	4424772.214	1750.986	0.26258	-0.21665	25.81282
30	0.050	-0.017	0.023	20	341792.636	4424975.896	1751.338	0.31396	-0.19862	25.68214
31	0.019	0.013	0.018	21	342209.829	4425180.522	1751.114	0.23550	-0.24032	25.71002
32	-0.022	-0.015	0.019	22	342622.242	4425376.253	1750.747	0.23746	-0.23517	25.79861
33	-0.057	-0.040	0.034	23	343033.213	4425573.531	1751.340	0.22837	-0.22947	25.78463
max standard deviations of terrain points				24	343449.340	4425780.265	1751.820	0.31032	-0.20802	25.69869
x	0.020 [meter] at point	20000078		25	343855.651	4425981.448	1750.881	0.23203	-0.23563	25.68566
y	0.024 [meter] at point	20000085		26	344274.990	4426178.953	1750.177	0.22371	-0.24657	25.68608
z	0.043 [meter] at point	20000085		27	344692.940	4426374.381	1752.689	0.22745	-0.23995	25.77917
mean standard deviations of terrain points				28	345101.039	4426570.850	1753.895	0.24072	-0.22756	25.82112
x	0.010			29	345514.339	4426775.964	1751.587	0.31092	-0.20244	25.61923
y	0.012			30	345932.873	4426973.160	1751.715	0.22180	-0.24342	25.64803
z	0.028			31	346346.684	4427158.742	1753.435	0.20518	-0.22788	25.73033
exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg])				32	346766.526	4427348.842	1754.061	0.24439	-0.22078	25.77978
rotations from terrain to photo (rotated axes)				33	347184.288	4427545.090	1752.767	0.28801	-0.20717	25.72518
photo ID	px	py	pz	omega	phi	kappa	=====			
13	338888.378	4423601.923	1751.698	0.25160	-0.21081	25.74575	Sigma naught : 0.4 [micron] = 0.1 [pixel in level 0]			
14	339303.655	4423807.104	1751.120	0.27268	-0.20843	25.67717				

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Aerotriangulación Toledo		Earth's curvature correction	: ON
		Atmospheric correction	: ON
		Do not eliminate manual points	: OFF
		Do not eliminate GNSS	: ON
Start Post Processing: Mon Aug 26 17:24:21 2019		Standard deviations (a-priori) :	
=====		-----	
Active Block	: complete Block	Ground control (planimetry) [m]	
Number of photos	: 33	Set	
Number of strips	: 2	0 (=default)	: 0.010
Photo scale	: 1:17654	Ground control (height) [m]	
Mean terrain height [m]	: 480	Set	
Automatic blunder detection	: OFF	0 (=default)	: 0.015
Use all adjusted points in project file		Automatic image points [mm]	
as control (absolute mode)	: OFF	Set	
Control parameter for block adjustment :		0 (=default)	: 0.001
-----		Image points of ground control and manual measurements [mm]	: 0.002
Selfcalibration	: OFF	GNSS X Y Z [m]	: 0.100 0.100 0.100
GNSS-Mode	: ON	INS omega phi kappa [deg]	: 0.010 0.010 0.010
Drift-Mode	: ON	Used Cameras in block:	
drift per block	: ON only shifts are enabled	-----	
drift for X,Y,Z	: ON,ON,ON	1 Eagle	
IMU-Mode	: ON		
IMU-Boresight	: OFF		

Distortion	: No correction	created 211 observations for photo	53
Tie Point Generator		created 128 observations for photo	54
-----		created 143 observations for photo	55
created 66 observations for photo	34	created 214 observations for photo	56
created 106 observations for photo	35	created 234 observations for photo	57
created 127 observations for photo	36	created 216 observations for photo	58
created 136 observations for photo	37	created 181 observations for photo	59
created 156 observations for photo	38	created 183 observations for photo	60
created 161 observations for photo	39	created 195 observations for photo	61
created 130 observations for photo	40	created 203 observations for photo	62
created 133 observations for photo	41	created 190 observations for photo	63
created 132 observations for photo	42	created 196 observations for photo	64
created 152 observations for photo	43	created 172 observations for photo	65
created 169 observations for photo	44	created 110 observations for photo	66
created 170 observations for photo	45	total of 5635 measurements in 33 photos are used for adjustment (total 33 photos)	
created 180 observations for photo	46	sigma naught 2.4 micron (17:24:21)	
created 197 observations for photo	47	sigma naught 0.5 micron (17:24:22)	
created 211 observations for photo	48	found 287 points connecting 2 photos	
created 203 observations for photo	49	found 730 points connecting 3 photos	
created 176 observations for photo	50	found 148 points connecting 4 photos	
created 213 observations for photo	51	found 103 points connecting 5 photos	
created 241 observations for photo	52	found 294 points connecting 6 photos	

number of observations	11495	z	0.016 [meter]					
number of unknowns	4890	sigma naught	0.5 micron (17:24:22)					
redundancy	6605	standard deviations of exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg/1000])						
RMS automatic points in photo (number: 5603)		photo ID	px	py	pz	omega	phi	kappa
x	0.4 micron	34	0.031	0.027	0.017	0.98636	1.41416	0.66645
y	0.4 micron	35	0.025	0.024	0.013	0.93055	1.07713	0.49495
RMS control and manual points in photo (number: 32)		36	0.023	0.021	0.013	0.84194	0.93700	0.41490
x	1.0 micron	37	0.022	0.020	0.013	0.79014	0.87667	0.36990
y	1.2 micron	38	0.022	0.020	0.014	0.77987	0.86450	0.33655
RMS control points with default standard deviation set (number: 9)		39	0.021	0.020	0.014	0.79416	0.81544	0.32755
x	0.005 [meter]	40	0.021	0.019	0.014	0.77193	0.79782	0.32961
y	0.003 [meter]	41	0.021	0.019	0.014	0.75337	0.81557	0.32044
RMS control points with default standard deviation set (number: 9)		42	0.021	0.019	0.014	0.76569	0.80996	0.30554
z	0.005 [meter]	43	0.020	0.018	0.013	0.73177	0.77560	0.27209
RMS IMU observations (number: 33)		44	0.019	0.019	0.013	0.75869	0.74332	0.29203
omega	0.008 [deg]	45	0.018	0.018	0.013	0.73007	0.66269	0.25463
phi	0.002 [deg]	46	0.017	0.018	0.013	0.72798	0.62274	0.24442
kappa	0.009 [deg]	47	0.017	0.018	0.012	0.73047	0.60618	0.23540
RMS GNSS observations (number: 33)		48	0.017	0.018	0.012	0.73718	0.60354	0.23580
x	0.066 [meter]	49	0.017	0.019	0.012	0.77060	0.61663	0.24743
y	0.129 [meter]	50	0.017	0.020	0.013	0.81170	0.62885	0.25094

51	0.018	0.019	0.012	0.79026	0.64389	0.27090	phi	1.4 [deg/1000] at photo	34
52	0.018	0.019	0.012	0.79624	0.69153	0.29809	kappa	0.7 [deg/1000] at photo	34
53	0.019	0.020	0.013	0.82070	0.73300	0.33359	mean standard deviations of translations		
54	0.022	0.024	0.016	0.90487	0.94462	0.41820	x	0.020 [meter]	
55	0.024	0.022	0.018	0.86176	0.97264	0.41100	y	0.020 [meter]	
56	0.019	0.020	0.015	0.81698	0.74003	0.33768	z	0.013 [meter]	
57	0.018	0.019	0.014	0.78428	0.62784	0.30459	max standard deviations of translations		
58	0.017	0.019	0.013	0.78793	0.60677	0.26827	x	0.031 [meter] at photo	34
59	0.017	0.019	0.013	0.76408	0.59481	0.25360	y	0.027 [meter] at photo	34
60	0.017	0.018	0.012	0.75038	0.63082	0.23558	z	0.018 [meter] at photo	55
61	0.017	0.018	0.012	0.72968	0.62559	0.24420	residuals horizontal control points in [meter]		
62	0.016	0.018	0.011	0.73262	0.58763	0.23840	control point ID	rx	ry
63	0.016	0.017	0.011	0.71733	0.59924	0.23548	PA-45	-0.002	0.001
64	0.017	0.018	0.011	0.72772	0.65777	0.25414	PA-46	-0.003	-0.003
65	0.018	0.019	0.011	0.75918	0.73915	0.28105	PA-47	-0.002	-0.003
66	0.023	0.022	0.013	0.80794	0.97887	0.37055	PA-48	-0.001	-0.001
mean standard deviations of rotations							PA-49	0.004	0.005
omega	0.8 [deg/1000]						PA-50	0.010	0.002
phi	0.8 [deg/1000]						PA-51	-0.007	-0.005
kappa	0.3 [deg/1000]						PA-52	-0.001	0.000
max standard deviations of rotations							PA-53	0.001	0.004
omega	1.0 [deg/1000] at photo			34	residuals vertical control points in [meter]				

				Estudio Informativo			
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control point ID	rz			43	-0.008	-0.003	-0.005
PA-45	0.001			44	-0.008	-0.003	-0.003
PA-46	-0.006			45	-0.010	-0.003	-0.002
PA-47	0.005			46	-0.009	-0.003	-0.001
PA-48	0.002			47	-0.008	-0.004	0.000
PA-49	-0.009			48	-0.009	-0.005	0.002
PA-50	0.007			49	-0.004	-0.001	0.003
PA-51	0.003			50	-0.005	-0.002	0.003
PA-52	-0.004			51	-0.008	-0.002	0.003
PA-53	0.000			52	-0.008	-0.002	0.003
residuals	IMU observations in [deg]			53	-0.005	-0.001	0.003
photo ID	omega	phi	kappa	54	-0.003	-0.000	0.003
34	-0.010	0.001	-0.014	55	0.013	0.001	-0.012
35	-0.008	0.002	-0.012	56	0.011	0.002	-0.012
36	-0.007	0.001	-0.010	57	0.009	-0.000	-0.011
37	-0.008	-0.001	-0.009	58	0.008	-0.001	-0.012
38	-0.007	-0.001	-0.008	59	0.010	-0.001	-0.012
39	-0.005	-0.001	-0.008	60	0.011	0.002	-0.012
40	-0.008	-0.002	-0.008	61	0.010	-0.000	-0.012
41	-0.006	-0.001	-0.007	62	0.008	-0.002	-0.012
42	-0.005	-0.003	-0.006	63	0.008	-0.001	-0.012

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64	0.008	0.000	-0.012	64	0.026	0.151	-0.003
65	0.006	-0.002	-0.013	46	0.053	-0.124	-0.008
66	0.005	-0.003	-0.013	63	0.051	0.162	-0.016
residuals GNSS observations in [meter]				47	0.072	-0.118	-0.014
photo ID	rx	ry	rz	62	0.063	0.143	-0.017
GNSS drift parameter for profile 1				48	0.097	-0.159	-0.027
constant part in [meter]	X	-0.004	Y	0.078	Z	0.409	
linear part in [meter]	X	-0.000	Y	-0.000	Z	0.000	
34	-0.168	-0.143	-0.014	60	-0.030	0.196	-0.001
35	-0.166	-0.082	-0.018	50	-0.009	-0.108	-0.029
36	-0.109	-0.048	0.001	59	0.041	0.191	0.004
37	-0.059	-0.056	0.002	51	-0.013	-0.197	-0.011
38	-0.036	-0.041	0.007	58	0.053	0.122	0.012
39	-0.022	0.017	0.019	52	-0.021	-0.201	-0.014
40	0.018	-0.056	0.027	57	0.012	0.142	-0.007
41	-0.016	-0.031	0.004	53	-0.060	-0.141	-0.001
42	0.031	-0.007	0.015	56	-0.051	0.175	0.014
43	0.031	-0.065	0.011	54	-0.077	-0.076	-0.004
66	0.109	0.099	0.034	55	-0.023	0.216	0.036
44	0.041	-0.060	0.016	max standard deviations of terrain points			
65	0.075	0.103	0.011	x	0.029 [meter] at point		30000087
45	0.061	-0.111	0.007	y	0.029 [meter] at point		20000103

z	0.052 [meter] at point	20000053	47	413319.149	4414282.627	1891.982	-0.09848	-0.30816	-42.47187				
mean standard deviations of terrain points			48	413632.212	4413993.689	1890.937	-0.06157	-0.33976	-42.46030				
x	0.010		49	413958.442	4413694.602	1890.941	-0.12983	-0.33394	-42.44537				
y	0.011		50	414279.909	4413403.187	1893.925	-0.14277	-0.26954	-42.41783				
z	0.026		51	414602.118	4413114.536	1892.689	-0.13070	-0.28317	-42.38663				
exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg])			52	414923.394	4412822.801	1891.003	-0.14492	-0.27368	-42.45210				
rotations from terrain to photo (rotated axes)			53	415245.186	4412529.828	1890.197	-0.09907	-0.32010	-42.44462				
photo ID	px	py	pz	omega	phi	kappa							
34	409170.780	4418144.232	1892.998	-0.11013	-0.29343	-42.44431	54	415565.710	4412234.313	1889.231	-0.13448	-0.29913	-42.36493
35	409487.587	4417852.776	1889.263	-0.14739	-0.27283	-42.40772	55	414936.835	4411544.674	1881.995	0.10514	0.30605	137.67348
36	409808.378	4417552.126	1888.449	-0.08380	-0.33508	-42.42841	56	414613.156	4411841.444	1883.295	0.09965	0.30937	137.76041
37	410129.301	4417252.352	1890.745	-0.14870	-0.27174	-42.53971	57	414293.317	4412134.652	1883.967	0.11074	0.29315	137.69472
38	410441.686	4416957.510	1889.679	-0.09590	-0.35205	-42.41541	58	413969.190	4412429.559	1883.666	0.12187	0.31813	137.69987
39	410761.452	4416659.108	1889.538	-0.09912	-0.32034	-42.46791	59	413650.674	4412718.216	1884.149	0.09024	0.32170	137.63313
40	411080.145	4416361.271	1891.686	-0.14625	-0.25598	-42.32180	60	413327.298	4413013.822	1885.018	0.08512	0.31210	137.61580
41	411400.616	4416067.135	1894.694	-0.12127	-0.32045	-42.38335	61	413013.059	4413307.458	1885.251	0.13832	0.27170	137.64811
42	411722.331	4415777.259	1894.296	-0.09154	-0.30544	-42.41100	62	412690.938	4413607.598	1884.668	0.05240	0.34333	137.67569
43	412050.144	4415479.147	1891.587	-0.11653	-0.29718	-42.44367	63	412375.118	4413901.503	1885.933	0.12449	0.29271	137.76275
44	412369.380	4415183.364	1889.266	-0.13940	-0.31206	-42.46038	64	412053.111	4414202.864	1885.218	0.13462	0.29018	137.69306
45	412686.408	4414886.299	1891.753	-0.07940	-0.32766	-42.49573	65	411734.316	4414496.538	1883.609	0.07321	0.34110	137.65254
46	412999.664	4414586.046	1892.671	-0.12384	-0.28625	-42.39719	66	411413.110	4414787.392	1885.626	0.12523	0.31025	137.71902
=====													

Sigma	naught	:	0.5	[micron]	=	0.1	[pixel	in	level	0]	Aerotriangulación Oropesa – Toledo
Start Post Processing: Wed Aug 14 17:21:13 2019											
=====											
Block			: complete Block								
Number of photos			: 243								
Number of strips			: 7								
Photo scale			: 1:48219								
Mean terrain height [m]			: 440								
Automatic blunder detection			: OFF								
Use all adjusted points in project file											
as control (absolute mode)			: OFF								
Control parameter for block adjustment :											

Selfcalibration			: OFF								
GPS-Mode			: ON								
Drift-Mode			: ON								
GPS Antenna Excentricity [m]			: 0.000 0.000 0.000								
INS-Mode			: ON								
INS-Boresight			: OFF								
Earth's curvature correction			: ON								
Atmospheric correction			: ON								

Estudio Informativo				
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Do not eliminate manual points	: OFF	created	36 observations for photo	5
Standard deviations (a-priori) :		created	47 observations for photo	6
-----		created	80 observations for photo	7
Ground control (planimetry) [m]		created	76 observations for photo	8
Set		created	75 observations for photo	9
0 (=default)	: 0.027	created	65 observations for photo	10
Ground control (height) [m]		created	64 observations for photo	11
Set		created	73 observations for photo	12
0 (=default)	: 0.040	created	69 observations for photo	13
Automatic image points [mm]		created	64 observations for photo	14
Set		created	57 observations for photo	15
0 (=default)	: 0.001	created	74 observations for photo	16
Image points of ground control and manual measurements [mm]	: 0.002	created	91 observations for photo	17
GPS	X Y Z [m] : 0.100 0.100 0.100	created	65 observations for photo	18
INS	omega phi kappa [deg] : 0.010 0.010 0.010	created	38 observations for photo	19
Tie Point Generator		created	46 observations for photo	20
-----		created	52 observations for photo	21
created	48 observations for photo 1	created	58 observations for photo	22
created	81 observations for photo 2	created	63 observations for photo	23
created	90 observations for photo 3	created	69 observations for photo	24
created	58 observations for photo 4	created	72 observations for photo	25

created	58 observations for photo	26	created	46 observations for photo	48
created	56 observations for photo	27	created	57 observations for photo	49
created	43 observations for photo	28	created	39 observations for photo	50
created	39 observations for photo	29	created	47 observations for photo	51
created	50 observations for photo	30	created	37 observations for photo	52
created	72 observations for photo	31	created	57 observations for photo	53
created	76 observations for photo	32	created	53 observations for photo	54
created	55 observations for photo	33	created	61 observations for photo	55
created	60 observations for photo	34	created	48 observations for photo	56
created	74 observations for photo	35	created	52 observations for photo	57
created	81 observations for photo	36	created	48 observations for photo	58
created	54 observations for photo	37	created	95 observations for photo	59
created	29 observations for photo	38	created	126 observations for photo	60
created	64 observations for photo	39	created	132 observations for photo	61
created	84 observations for photo	40	created	140 observations for photo	62
created	82 observations for photo	41	created	118 observations for photo	63
created	56 observations for photo	42	created	91 observations for photo	64
created	54 observations for photo	43	created	102 observations for photo	65
created	60 observations for photo	44	created	87 observations for photo	66
created	65 observations for photo	45	created	123 observations for photo	67
created	61 observations for photo	46	created	121 observations for photo	68
created	53 observations for photo	47	created	125 observations for photo	69

Estudio Informativo					
Línea Ferroviaria de Alta Velocidad Madrid – Extremadura. Tramo: Madrid - Oropesa					
created	74 observations for photo	70	created	39 observations for photo	91
created	41 observations for photo	71	created	60 observations for photo	92
created	42 observations for photo	72	created	71 observations for photo	93
created	43 observations for photo	73	created	75 observations for photo	94
created	55 observations for photo	74	created	68 observations for photo	95
created	53 observations for photo	75	created	52 observations for photo	96
created	44 observations for photo	76	created	68 observations for photo	97
created	38 observations for photo	77	created	56 observations for photo	98
created	33 observations for photo	78	created	63 observations for photo	99
created	46 observations for photo	79	created	52 observations for photo	100
created	50 observations for photo	80	created	49 observations for photo	101
created	57 observations for photo	81	created	51 observations for photo	102
created	43 observations for photo	82	created	55 observations for photo	103
created	37 observations for photo	83	created	65 observations for photo	104
created	35 observations for photo	84	created	63 observations for photo	105
created	30 observations for photo	85	created	74 observations for photo	106
created	44 observations for photo	86	created	61 observations for photo	107
created	56 observations for photo	87	created	42 observations for photo	108
created	84 observations for photo	88	created	43 observations for photo	109
created	67 observations for photo	89	created	50 observations for photo	110
created	68 observations for photo	90	created	73 observations for photo	111

created 67 observations for photo	112	created 58 observations for photo	134
created 75 observations for photo	113	created 58 observations for photo	135
created 58 observations for photo	114	created 62 observations for photo	136
created 75 observations for photo	115	created 58 observations for photo	137
created 67 observations for photo	116	created 61 observations for photo	138
created 79 observations for photo	117	created 46 observations for photo	139
created 62 observations for photo	118	created 51 observations for photo	140
created 61 observations for photo	119	created 59 observations for photo	141
created 61 observations for photo	120	created 45 observations for photo	142
created 65 observations for photo	121	created 54 observations for photo	143
created 65 observations for photo	122	created 42 observations for photo	144
created 69 observations for photo	123	created 67 observations for photo	145
created 40 observations for photo	124	created 61 observations for photo	146
created 63 observations for photo	125	created 53 observations for photo	147
created 90 observations for photo	126	created 55 observations for photo	148
created 80 observations for photo	127	created 61 observations for photo	149
created 53 observations for photo	128	created 47 observations for photo	150
created 96 observations for photo	129	created 44 observations for photo	151
created 122 observations for photo	130	created 61 observations for photo	152
created 95 observations for photo	131	created 75 observations for photo	153
created 66 observations for photo	132	created 71 observations for photo	154
created 75 observations for photo	133	created 55 observations for photo	155

created	33 observations for photo	156	created	69 observations for photo	191
created	35 observations for photo	157	created	64 observations for photo	192
created	76 observations for photo	158	created	58 observations for photo	193
created	95 observations for photo	159	created	50 observations for photo	194
created	91 observations for photo	160	created	37 observations for photo	195
created	107 observations for photo	161	created	43 observations for photo	196
created	108 observations for photo	162	created	63 observations for photo	197
created	102 observations for photo	163	created	62 observations for photo	198
created	112 observations for photo	164	created	60 observations for photo	199
created	123 observations for photo	165	created	68 observations for photo	200
created	116 observations for photo	166	created	47 observations for photo	201
created	105 observations for photo	167	created	63 observations for photo	202
created	57 observations for photo	168	created	41 observations for photo	203
created	54 observations for photo	169	created	46 observations for photo	204
created	53 observations for photo	170	created	55 observations for photo	205
created	54 observations for photo	171	created	85 observations for photo	206
created	55 observations for photo	172	created	90 observations for photo	207
created	43 observations for photo	173	created	109 observations for photo	208
created	28 observations for photo	174	created	40 observations for photo	209
created	40 observations for photo	189	created	64 observations for photo	210
created	65 observations for photo	190	created	78 observations for photo	211

created 72 observations for photo	212	created 58 observations for photo	234
created 51 observations for photo	213	created 52 observations for photo	235
created 31 observations for photo	214	created 44 observations for photo	236
created 36 observations for photo	215	created 61 observations for photo	237
created 38 observations for photo	216	created 54 observations for photo	238
created 49 observations for photo	217	created 41 observations for photo	239
created 67 observations for photo	218	created 48 observations for photo	240
created 53 observations for photo	219	created 54 observations for photo	241
created 36 observations for photo	220	created 37 observations for photo	242
created 58 observations for photo	221	created 52 observations for photo	243
created 91 observations for photo	222	created 57 observations for photo	244
created 99 observations for photo	223	created 66 observations for photo	245
created 71 observations for photo	224	created 41 observations for photo	246
created 64 observations for photo	225	created 42 observations for photo	247
created 64 observations for photo	226	created 57 observations for photo	248
created 62 observations for photo	227	created 73 observations for photo	249
created 48 observations for photo	228	created 63 observations for photo	250
created 30 observations for photo	229	created 55 observations for photo	251
created 40 observations for photo	230	created 52 observations for photo	252
created 47 observations for photo	231	created 86 observations for photo	253
created 50 observations for photo	232	created 108 observations for photo	254
created 67 observations for photo	233	created 143 observations for photo	255

Estudio Informativo									
Línea Ferroviaria de Alta Velocidad Madrid – Extremadura. Tramo: Madrid - Oropesa									
created	124 observations for photo	256		y	0.4 micron				
created	107 observations for photo	257				RMS	control points in photo		
total of 15483 measurements in 243 photos are used for adjustment				x	2.0 micron				
sigma naught	2.0 micron (17:21:15)			y	1.6 micron				
sigma naught	0.5 micron (17:21:15)					RMS	control points with default standard deviation set		
found	515 points connecting	2 photos		x	0.030 [meter]				
found	1440 points connecting	3 photos		y	0.023 [meter]				
found	290 points connecting	4 photos				RMS	control points with default standard deviation set		
found	357 points connecting	5 photos		z	0.022 [meter]				
found	899 points connecting	6 photos				RMS	INS observations		
found	46 points connecting	7 photos		omega	0.006 [deg]				
found	44 points connecting	8 photos		phi	0.005 [deg]				
found	54 points connecting	9 photos		kappa	0.011 [deg]				
found	22 points connecting	10 photos				RMS	GPS observations		
found	7 points connecting	11 photos		x	0.057 [meter]				
found	28 points connecting	12 photos		y	0.051 [meter]				
number of observations	32568			z	0.043 [meter]				
number of unknowns	12609					standard deviations of exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg/1000])			
redundancy	19959					photo ID	px	py	pz
RMS automatic points in photo						omega	phi	kappa	
	x	0.4 micron				1	0.050	0.065	0.033
						10	0.044	0.055	0.027
							0.8110	0.7309	0.4747
							0.7667	0.6069	0.3179

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100	0.044	0.063	0.037	0.9436	0.5682	0.3521	120	0.041	0.046	0.027	0.6767	0.5524	0.3201
101	0.044	0.062	0.038	0.9176	0.5698	0.3811	121	0.040	0.048	0.028	0.6937	0.5490	0.3453
102	0.044	0.060	0.037	0.9142	0.5950	0.3500	122	0.041	0.049	0.031	0.7266	0.5823	0.3320
103	0.043	0.060	0.036	0.8909	0.5937	0.3428	123	0.043	0.050	0.031	0.7425	0.5805	0.3534
104	0.045	0.060	0.035	0.9027	0.6057	0.3460	124	0.042	0.052	0.032	0.7623	0.5733	0.3361
105	0.043	0.059	0.035	0.8864	0.5753	0.3875	125	0.042	0.048	0.029	0.6797	0.5434	0.3845
106	0.044	0.058	0.033	0.8716	0.6007	0.3807	126	0.043	0.048	0.028	0.6658	0.6005	0.3457
107	0.045	0.057	0.034	0.8616	0.6542	0.3481	127	0.044	0.048	0.029	0.6731	0.6367	0.3502
108	0.046	0.058	0.034	0.8772	0.6572	0.3959	128	0.049	0.054	0.033	0.7452	0.7228	0.4868
109	0.050	0.059	0.034	0.8881	0.7302	0.4594	129	0.034	0.047	0.024	0.6260	0.4442	0.2419
11	0.044	0.054	0.026	0.7631	0.5823	0.3710	13	0.042	0.053	0.027	0.7467	0.5698	0.3546
110	0.048	0.056	0.034	0.8476	0.6950	0.3556	130	0.033	0.045	0.023	0.6006	0.4473	0.2135
111	0.042	0.055	0.030	0.7980	0.5540	0.3747	131	0.032	0.046	0.024	0.6139	0.4285	0.2054
112	0.043	0.053	0.032	0.7810	0.5954	0.3464	132	0.041	0.049	0.026	0.6523	0.5626	0.2461
113	0.045	0.051	0.030	0.7623	0.6250	0.3498	133	0.037	0.049	0.028	0.6598	0.5092	0.2509
114	0.045	0.053	0.031	0.8041	0.6056	0.3244	134	0.044	0.052	0.031	0.7110	0.6357	0.2967
115	0.041	0.052	0.030	0.7800	0.5619	0.3298	135	0.043	0.054	0.033	0.7666	0.5829	0.3289
116	0.043	0.050	0.030	0.7473	0.5935	0.3582	136	0.047	0.050	0.032	0.7105	0.6434	0.3937
117	0.040	0.048	0.029	0.7318	0.5185	0.2959	137	0.044	0.050	0.030	0.7149	0.6266	0.3194
118	0.044	0.050	0.029	0.7394	0.5961	0.3412	138	0.044	0.050	0.029	0.7199	0.5575	0.3741
119	0.044	0.046	0.027	0.6723	0.6147	0.3727	139	0.042	0.050	0.029	0.7266	0.5860	0.3475
12	0.039	0.053	0.028	0.7582	0.5251	0.2828	14	0.040	0.051	0.027	0.7249	0.5239	0.2989

140	0.043	0.050	0.027	0.7310	0.6403	0.3703	16	0.042	0.052	0.025	0.7302	0.5995	0.3267
141	0.040	0.048	0.027	0.6977	0.5373	0.3355	160	0.035	0.047	0.025	0.6363	0.4719	0.2115
142	0.041	0.052	0.029	0.7401	0.5898	0.3437	161	0.034	0.043	0.024	0.5967	0.4435	0.1928
143	0.041	0.052	0.029	0.7572	0.5439	0.3604	162	0.038	0.045	0.025	0.6224	0.5299	0.2099
144	0.048	0.054	0.031	0.8005	0.6923	0.3765	163	0.042	0.047	0.024	0.6530	0.6049	0.2419
145	0.046	0.052	0.029	0.7772	0.6641	0.4447	164	0.034	0.049	0.023	0.6832	0.4838	0.2168
146	0.047	0.051	0.032	0.7836	0.7237	0.3589	165	0.032	0.046	0.024	0.6591	0.4290	0.2053
147	0.045	0.049	0.027	0.7175	0.5733	0.3803	166	0.033	0.045	0.025	0.6497	0.4654	0.2247
148	0.043	0.050	0.029	0.7306	0.6527	0.3527	167	0.040	0.046	0.028	0.6728	0.5650	0.2588
149	0.042	0.049	0.028	0.7037	0.5907	0.3670	168	0.049	0.048	0.030	0.7355	0.7161	0.2964
15	0.041	0.049	0.025	0.7001	0.5193	0.3127	169	0.057	0.057	0.031	0.9023	0.7734	0.3818
150	0.042	0.052	0.029	0.7569	0.5779	0.3534	17	0.042	0.049	0.025	0.6900	0.5774	0.4050
151	0.043	0.053	0.029	0.7760	0.5773	0.3316	170	0.063	0.068	0.035	1.0745	0.9109	0.4315
152	0.045	0.050	0.028	0.7120	0.6394	0.4233	171	0.067	0.067	0.035	1.0328	0.9270	0.5260
153	0.040	0.047	0.029	0.6951	0.5298	0.2979	172	0.066	0.072	0.033	1.0517	0.8705	0.4390
154	0.044	0.049	0.029	0.7044	0.5911	0.3578	173	0.072	0.084	0.037	1.1708	0.9767	0.5454
155	0.043	0.052	0.029	0.7258	0.5525	0.3960	174	0.082	0.092	0.051	1.2044	1.1924	0.8146
156	0.045	0.055	0.030	0.7617	0.6023	0.3180	18	0.042	0.050	0.027	0.7156	0.5940	0.3142
157	0.045	0.056	0.030	0.7572	0.6065	0.3565	189	0.060	0.081	0.042	0.9581	0.9111	0.4856
158	0.045	0.053	0.029	0.7294	0.6324	0.2902	19	0.051	0.053	0.030	0.7688	0.7014	0.4516
159	0.037	0.049	0.027	0.6661	0.5024	0.2287	190	0.050	0.076	0.035	0.9434	0.7227	0.3425

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191	0.044	0.067	0.032	0.8552	0.5929	0.3106	210	0.056	0.082	0.039	1.1168	0.7649	0.3740
192	0.046	0.068	0.035	0.9047	0.5927	0.3529	211	0.052	0.080	0.038	1.1018	0.6884	0.3600
193	0.053	0.067	0.038	0.9293	0.7340	0.3464	212	0.050	0.077	0.038	1.0662	0.6687	0.3470
194	0.048	0.065	0.037	0.9151	0.6672	0.3653	213	0.048	0.072	0.037	1.0033	0.6410	0.3750
195	0.049	0.063	0.035	0.8772	0.6879	0.4379	214	0.055	0.073	0.039	1.0434	0.7792	0.3984
196	0.046	0.060	0.035	0.8495	0.6304	0.3308	215	0.052	0.066	0.034	0.9139	0.6675	0.4200
197	0.046	0.057	0.034	0.8180	0.5708	0.4037	216	0.055	0.071	0.036	0.9684	0.7586	0.3813
198	0.045	0.056	0.035	0.8161	0.6090	0.3865	217	0.051	0.070	0.034	0.9497	0.6473	0.3900
199	0.046	0.056	0.036	0.8221	0.6498	0.3723	218	0.054	0.076	0.033	1.0009	0.7233	0.3605
2	0.046	0.059	0.028	0.7735	0.6492	0.3528	219	0.064	0.085	0.036	1.0972	0.9123	0.3931
20	0.048	0.056	0.036	0.8393	0.6936	0.4323	22	0.044	0.048	0.027	0.7170	0.6036	0.3434
200	0.052	0.056	0.035	0.8239	0.7167	0.3986	220	0.075	0.096	0.046	1.1854	1.0864	0.6074
201	0.052	0.062	0.037	0.9187	0.7648	0.4298	221	0.049	0.062	0.036	0.8925	0.6935	0.3676
202	0.053	0.065	0.038	0.9772	0.7737	0.4324	222	0.040	0.055	0.035	0.7581	0.5783	0.3222
203	0.055	0.066	0.041	0.9904	0.8267	0.5279	223	0.042	0.053	0.035	0.7345	0.5895	0.2926
204	0.054	0.063	0.040	0.9402	0.7594	0.4419	224	0.042	0.054	0.035	0.7348	0.5537	0.2977
205	0.049	0.060	0.038	0.8479	0.7238	0.4016	225	0.039	0.053	0.034	0.7362	0.4968	0.2974
206	0.046	0.060	0.035	0.8459	0.6535	0.3449	226	0.042	0.055	0.033	0.7658	0.5795	0.2941
207	0.041	0.056	0.032	0.7906	0.5801	0.3273	227	0.042	0.055	0.033	0.7766	0.5765	0.3006
208	0.048	0.057	0.031	0.8125	0.6787	0.2709	228	0.044	0.055	0.032	0.7714	0.5940	0.3608
209	0.067	0.094	0.047	1.2578	0.9324	0.4515	229	0.051	0.058	0.034	0.8463	0.6967	0.3657
21	0.043	0.050	0.029	0.7230	0.6076	0.3648	23	0.040	0.047	0.025	0.6639	0.5499	0.3553

230	0.043	0.052	0.029	0.7415	0.5596	0.4214
231	0.048	0.057	0.031	0.8214	0.6736	0.3730
232	0.048	0.055	0.030	0.7972	0.6809	0.4608
233	0.042	0.050	0.028	0.7229	0.5765	0.3486
234	0.047	0.052	0.029	0.7514	0.6957	0.3773
235	0.043	0.048	0.026	0.6846	0.5388	0.4033
236	0.041	0.048	0.027	0.6906	0.5866	0.3250
237	0.043	0.048	0.026	0.6992	0.6158	0.3676
238	0.048	0.050	0.030	0.7486	0.7133	0.4100
239	0.046	0.052	0.029	0.7768	0.6225	0.3964
24	0.042	0.046	0.025	0.6742	0.5936	0.3378
240	0.047	0.053	0.031	0.8129	0.6973	0.3749
241	0.045	0.049	0.026	0.7184	0.6076	0.4334
242	0.049	0.051	0.027	0.7484	0.7391	0.3883
243	0.042	0.047	0.025	0.6806	0.5581	0.3610
244	0.042	0.049	0.025	0.7199	0.6094	0.3530
245	0.043	0.046	0.024	0.6608	0.5669	0.4042
246	0.047	0.050	0.026	0.7091	0.7050	0.3453
247	0.040	0.045	0.024	0.6313	0.5175	0.3711
248	0.041	0.047	0.026	0.6648	0.5714	0.3060
249	0.041	0.048	0.026	0.6628	0.5906	0.3290

25	0.039	0.045	0.024	0.6400	0.5160	0.3697
250	0.044	0.051	0.026	0.6917	0.5669	0.3820
251	0.046	0.052	0.026	0.7393	0.6270	0.2870
252	0.045	0.057	0.026	0.7873	0.6389	0.3592
253	0.041	0.047	0.021	0.6225	0.5507	0.2569
254	0.038	0.045	0.020	0.5930	0.5329	0.2208
255	0.034	0.044	0.018	0.5823	0.4769	0.1898
256	0.035	0.044	0.020	0.5829	0.4890	0.2034
257	0.038	0.051	0.027	0.7299	0.5194	0.2434
26	0.044	0.046	0.026	0.6859	0.6309	0.3007
27	0.042	0.046	0.025	0.6756	0.5297	0.3821
28	0.045	0.052	0.029	0.7861	0.6515	0.3519
29	0.045	0.052	0.028	0.7830	0.6149	0.4104
3	0.043	0.057	0.027	0.7517	0.6057	0.3217
30	0.045	0.052	0.029	0.7635	0.6294	0.4118
31	0.041	0.046	0.025	0.6794	0.5843	0.3718
32	0.036	0.044	0.025	0.6493	0.5151	0.3000
33	0.045	0.049	0.026	0.7030	0.6312	0.3622
34	0.043	0.045	0.025	0.6628	0.5529	0.3619
35	0.040	0.045	0.025	0.6506	0.5920	0.3727
36	0.040	0.046	0.025	0.6612	0.6002	0.3714

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37	0.047	0.051	0.028	0.7210	0.7084	0.3730	57	0.045	0.051	0.026	0.7310	0.5871	0.3608
38	0.046	0.050	0.024	0.7019	0.6140	0.4350	58	0.044	0.057	0.033	0.8276	0.6556	0.3254
39	0.044	0.045	0.025	0.6300	0.6337	0.3204	59	0.043	0.051	0.027	0.7345	0.5716	0.3047
4	0.047	0.063	0.028	0.8515	0.6473	0.3463	6	0.048	0.064	0.032	0.8732	0.6588	0.3900
40	0.040	0.043	0.023	0.6077	0.5464	0.3805	60	0.034	0.047	0.026	0.6753	0.4595	0.2452
41	0.039	0.044	0.025	0.6404	0.5386	0.3083	61	0.032	0.043	0.023	0.6119	0.4356	0.2234
42	0.047	0.050	0.027	0.7093	0.6573	0.4136	62	0.031	0.042	0.022	0.5794	0.4351	0.2039
43	0.047	0.050	0.027	0.7415	0.6227	0.3350	63	0.035	0.044	0.023	0.6039	0.5191	0.2164
44	0.045	0.051	0.027	0.7355	0.6419	0.3368	64	0.038	0.047	0.026	0.6282	0.5570	0.2762
45	0.043	0.045	0.023	0.6308	0.6183	0.3360	65	0.035	0.043	0.021	0.5765	0.5066	0.2181
46	0.047	0.047	0.024	0.6600	0.6757	0.3278	66	0.034	0.044	0.020	0.5823	0.4972	0.2034
47	0.043	0.048	0.025	0.6564	0.6110	0.3799	67	0.028	0.041	0.019	0.5501	0.3837	0.1847
48	0.047	0.054	0.028	0.7866	0.6436	0.4346	68	0.030	0.041	0.020	0.5591	0.4206	0.1933
49	0.046	0.054	0.027	0.8168	0.6489	0.3601	69	0.030	0.042	0.021	0.5805	0.4192	0.2139
5	0.045	0.061	0.030	0.8421	0.5882	0.3693	7	0.045	0.058	0.031	0.8140	0.6171	0.3515
50	0.046	0.056	0.029	0.8162	0.6919	0.3944	70	0.035	0.045	0.023	0.6168	0.4955	0.2420
51	0.047	0.057	0.028	0.8331	0.6856	0.4706	71	0.047	0.052	0.027	0.7193	0.6744	0.3076
52	0.047	0.055	0.029	0.7858	0.6629	0.3673	72	0.040	0.049	0.026	0.6886	0.5276	0.3359
53	0.041	0.049	0.026	0.6675	0.5664	0.4052	73	0.044	0.053	0.030	0.7948	0.6315	0.3397
54	0.041	0.049	0.026	0.6831	0.5576	0.3585	74	0.044	0.051	0.027	0.7607	0.5984	0.3789
55	0.040	0.048	0.025	0.6628	0.5356	0.3350	75	0.046	0.055	0.030	0.8406	0.6569	0.3917
56	0.043	0.050	0.027	0.7043	0.6134	0.3345	76	0.049	0.055	0.029	0.8273	0.7160	0.4745

77	0.049	0.056	0.031	0.8612	0.6984	0.3912		96	0.046	0.061	0.035	0.9205	0.6521	0.3631
78	0.046	0.053	0.031	0.7872	0.6893	0.4100		97	0.045	0.059	0.033	0.8813	0.5730	0.3760
79	0.045	0.052	0.029	0.7797	0.6381	0.4066		98	0.042	0.060	0.034	0.8840	0.5987	0.3348
8	0.044	0.054	0.028	0.7457	0.6086	0.3535		99	0.042	0.061	0.034	0.8965	0.5491	0.3601
80	0.039	0.049	0.030	0.7100	0.5650	0.3487	mean standard deviations of rotations							
81	0.042	0.051	0.029	0.7477	0.5898	0.4068	omega	0.8 [deg/1000]						
82	0.045	0.052	0.031	0.7815	0.6424	0.3827	phi	0.6 [deg/1000]						
83	0.044	0.051	0.029	0.7289	0.6142	0.4377	kappa	0.4 [deg/1000]						
84	0.049	0.054	0.031	0.7842	0.6836	0.4347	max standard deviations of rotations							
85	0.048	0.053	0.029	0.7590	0.7059	0.4614	omega	1.3 [deg/1000] at photo				209		
86	0.046	0.051	0.029	0.7381	0.6222	0.3690	phi	1.2 [deg/1000] at photo				174		
87	0.047	0.052	0.028	0.7287	0.6419	0.4196	kappa	0.8 [deg/1000] at photo				174		
88	0.042	0.050	0.028	0.7293	0.5680	0.3215	mean standard deviations of translations							
89	0.046	0.054	0.032	0.7935	0.6394	0.3905	x	0.044 [meter]						
9	0.039	0.052	0.027	0.7332	0.5310	0.2829	y	0.054 [meter]						
90	0.047	0.053	0.031	0.8014	0.6567	0.3731	z	0.030 [meter]						
91	0.044	0.058	0.032	0.8475	0.6026	0.3267	max standard deviations of translations							
92	0.043	0.057	0.032	0.8397	0.5894	0.3435	x	0.082 [meter] at photo				174		
93	0.043	0.056	0.032	0.8304	0.5932	0.3572	y	0.096 [meter] at photo				220		
94	0.043	0.056	0.032	0.8347	0.5962	0.3358	z	0.051 [meter] at photo				174		
95	0.041	0.058	0.032	0.8741	0.5599	0.3268	residuals horizontal control points in [meter]							

control point ID	rx	ry			
			PA-28	0.010	0.017
PA-01	0.005	0.002	PA-29	-0.050	-0.025
PA-02	-0.046	-0.012	PA-30	0.010	-0.013
PA-03	0.037	-0.020	PA-31	0.024	-0.010
PA-04	0.003	0.024	PA-32	-0.001	0.020
PA-05	-0.037	0.013	PA-34	-0.010	0.002
PA-06	0.068	-0.020	PA-35	0.012	0.018
PA-07	-0.020	-0.006	PA-36	0.005	0.037
PA-08	0.015	-0.007	PA-37	-0.069	-0.108
PA-12	0.009	0.005	PA-38	0.016	0.028
PA-13	-0.093	0.017	PA-39	-0.011	0.024
PA-15	0.075	0.009	PA-40	0.010	0.023
PA-16	-0.019	-0.014	PA-41	-0.002	-0.010
PA-17	-0.019	-0.005	PA-43	0.035	-0.020
PA-18	0.011	-0.012	PA-44	-0.004	0.012
PA-19	0.014	0.035	PA-45	-0.025	0.012
PA-20	-0.056	-0.008	PA-46	0.013	-0.007
PA-21	-0.010	0.002	PA-47	0.005	-0.008
PA-22	0.037	-0.007	PA-48	-0.004	-0.008
PA-23	-0.005	-0.009	PA-49	0.003	0.014
PA-25	0.040	0.010	PA-54	0.003	-0.003
PA-27	0.013	0.011	PA-55	0.022	0.024

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PA-57	-0.009	-0.022	PA-19	-0.005	
PA-58	0.013	-0.012	PA-20	-0.007	
PA-59	0.007	0.022	PA-21	0.004	
PA-60	-0.011	0.008	PA-22	0.000	
PA-61	-0.017	-0.022	PA-23	0.009	
residuals vertical control points in [meter]			PA-25	0.014	
control point ID	rz		PA-27	-0.105	
PA-01	-0.008		PA-28	-0.007	
PA-02	0.022		PA-29	0.004	
PA-03	0.024		PA-30	0.002	
PA-04	-0.036		PA-31	0.012	
PA-05	0.016		PA-32	-0.028	
PA-06	0.038		PA-34	-0.025	
PA-07	0.003		PA-35	-0.009	
PA-08	-0.011		PA-36	-0.010	
PA-12	-0.005		PA-37	0.000	
PA-13	0.028		PA-38	0.036	
PA-15	-0.002		PA-39	0.023	
PA-16	0.006		PA-40	-0.032	
PA-17	0.023		PA-41	-0.004	
PA-18	0.020		PA-43	0.014	

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PA-44	-0.002				105	-0.003	-0.007	0.012
PA-45	0.007				106	-0.003	-0.006	0.011
PA-46	0.004				107	-0.005	-0.006	0.010
PA-47	0.009				108	-0.005	-0.006	0.009
PA-48	0.009				109	-0.005	-0.005	0.008
PA-49	-0.026				11	0.007	0.007	0.014
PA-54	0.002				110	-0.004	-0.005	0.007
PA-55	-0.007				111	-0.003	-0.003	0.006
PA-57	0.011				112	-0.004	-0.003	0.006
PA-58	-0.016				113	-0.004	-0.004	0.005
PA-59	0.022				114	-0.005	-0.002	0.005
PA-60	-0.006				115	-0.004	-0.002	0.005
PA-61	-0.014				116	-0.004	-0.002	0.004
residuals INS observations in [deg]					117	-0.003	-0.001	0.004
photo ID	omega	phi	kappa		118	-0.002	-0.001	0.004
1	0.008	0.007	0.014		119	-0.001	-0.001	0.003
10	0.006	0.007	0.014		12	0.009	0.009	0.014
100	-0.002	-0.004	0.010		120	-0.001	-0.002	0.002
101	-0.004	-0.003	0.011		121	-0.004	-0.002	0.002
102	-0.003	-0.006	0.011		122	-0.002	-0.003	0.001
103	-0.002	-0.006	0.012		123	0.000	-0.002	0.001
104	-0.003	-0.007	0.012		124	-0.001	-0.002	0.001

125	-0.002	-0.002	0.001
126	-0.002	-0.003	0.002
127	-0.001	-0.004	0.001
128	-0.002	-0.003	0.001
129	-0.013	-0.000	0.014
13	0.007	0.008	0.014
130	-0.009	-0.004	0.013
131	-0.010	-0.006	0.013
132	-0.012	-0.005	0.013
133	-0.010	-0.004	0.013
134	-0.008	-0.006	0.012
135	-0.008	-0.004	0.012
136	-0.007	-0.003	0.011
137	-0.007	-0.006	0.012
138	-0.008	-0.006	0.013
139	-0.007	-0.005	0.012
14	0.009	0.009	0.013
140	-0.008	-0.005	0.011
141	-0.007	-0.005	0.011
142	-0.008	-0.005	0.012
143	-0.008	-0.006	0.013

144	-0.007	-0.006	0.012
145	-0.006	-0.003	0.010
146	-0.007	-0.005	0.012
147	-0.006	-0.005	0.012
148	-0.007	-0.005	0.012
149	-0.008	-0.006	0.013
15	0.007	0.008	0.013
150	-0.006	-0.006	0.013
151	-0.006	-0.009	0.011
152	-0.005	-0.005	0.009
153	-0.005	-0.006	0.008
154	-0.004	-0.005	0.005
155	-0.006	-0.006	0.004
156	-0.007	-0.006	0.005
157	-0.007	-0.006	0.006
158	-0.008	-0.006	0.005
159	-0.009	-0.004	0.005
16	0.007	0.008	0.013
160	-0.007	-0.007	0.005
161	-0.008	-0.004	0.005
162	-0.009	-0.003	0.005

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163	-0.008	-0.002	0.003	196	0.006	0.007	-0.004
164	-0.009	-0.002	0.004	197	0.008	0.007	-0.005
165	-0.009	-0.001	0.004	198	0.008	0.006	-0.004
166	-0.010	-0.002	0.003	199	0.006	0.005	-0.005
167	-0.012	-0.003	0.004	2	0.010	0.007	0.015
168	-0.012	-0.000	0.005	20	0.006	0.006	0.015
169	-0.013	-0.000	0.005	200	0.009	0.004	-0.005
17	0.007	0.008	0.013	201	0.006	0.004	-0.006
170	-0.012	-0.001	0.006	202	0.005	0.005	-0.006
171	-0.014	-0.002	0.004	203	0.004	0.006	-0.008
172	-0.015	-0.001	0.003	204	0.005	0.007	-0.007
173	-0.014	-0.000	0.003	205	0.003	0.006	-0.007
174	-0.017	0.001	0.002	206	0.004	0.006	-0.007
18	0.008	0.007	0.013	207	0.005	0.006	-0.007
189	0.008	0.008	0.000	208	0.005	0.002	-0.007
19	0.007	0.006	0.014	209	-0.004	-0.005	-0.002
190	0.009	0.009	-0.000	21	0.006	0.006	0.014
191	0.009	0.009	-0.001	210	-0.002	-0.005	-0.002
192	0.010	0.006	-0.001	211	-0.002	-0.005	-0.002
193	0.009	0.007	-0.002	212	-0.003	-0.006	-0.002
194	0.008	0.009	-0.003	213	-0.003	-0.005	-0.002
195	0.008	0.010	-0.004	214	-0.004	-0.006	-0.003

215	-0.004	-0.005	-0.004	234	0.009	0.003	-0.006
216	-0.005	-0.006	-0.004	235	0.008	0.003	-0.006
217	-0.005	-0.006	-0.005	236	0.006	0.004	-0.005
218	-0.006	-0.006	-0.006	237	0.009	0.005	-0.004
219	-0.005	-0.008	-0.005	238	0.007	0.006	-0.005
22	0.006	0.007	0.014	239	0.008	0.005	-0.004
220	-0.006	-0.005	-0.007	24	0.007	0.005	0.016
221	0.005	0.005	-0.001	240	0.005	0.006	-0.005
222	0.005	0.005	-0.001	241	0.005	0.007	-0.004
223	0.004	0.004	-0.002	242	0.003	0.007	-0.005
224	0.002	0.002	-0.003	243	0.003	0.005	-0.009
225	0.006	0.005	-0.003	244	0.002	0.004	-0.010
226	0.005	0.002	-0.004	245	0.004	0.003	-0.010
227	0.003	0.006	-0.005	246	0.004	0.003	-0.008
228	0.005	0.003	-0.007	247	0.005	0.004	-0.007
229	0.004	0.003	-0.008	248	0.004	0.005	-0.008
23	0.005	0.007	0.015	249	0.005	0.003	-0.007
230	0.006	0.005	-0.009	25	0.005	0.006	0.014
231	0.007	0.003	-0.009	250	0.005	0.006	-0.006
232	0.006	0.003	-0.009	251	0.003	0.004	-0.006
233	0.009	0.002	-0.008	252	0.004	0.004	-0.007

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253	0.005	0.003	-0.007	41	0.005	0.005	0.013
254	0.003	0.003	-0.006	42	0.002	0.004	0.013
255	0.004	0.002	-0.006	43	0.002	0.005	0.014
256	0.006	0.001	-0.005	44	0.003	0.006	0.014
257	0.002	0.002	-0.005	45	0.002	0.006	0.014
26	0.006	0.007	0.015	46	0.004	0.004	0.013
27	0.006	0.006	0.015	47	0.005	0.006	0.011
28	0.007	0.008	0.016	48	0.004	0.005	0.010
29	0.008	0.007	0.016	49	0.004	0.003	0.010
3	0.009	0.006	0.015	5	0.008	0.007	0.013
30	0.009	0.009	0.015	50	0.003	0.002	0.009
31	0.006	0.010	0.013	51	0.002	0.003	0.007
32	0.006	0.006	0.013	52	0.002	0.004	0.009
33	0.004	0.006	0.015	53	0.001	0.006	0.009
34	0.005	0.006	0.014	54	0.002	0.006	0.010
35	0.003	0.007	0.013	55	0.002	0.006	0.010
36	0.003	0.004	0.014	56	0.001	0.007	0.011
37	0.003	0.005	0.015	57	-0.001	0.006	0.011
38	0.004	0.006	0.013	58	0.002	0.007	0.010
39	0.004	0.007	0.013	59	0.002	0.006	0.009
4	0.008	0.007	0.014	6	0.007	0.008	0.014
40	0.004	0.006	0.013	60	0.004	0.007	0.009

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61	0.004	0.006	0.009	80	-0.006	-0.007	0.017
62	0.004	0.005	0.008	81	-0.006	-0.006	0.017
63	0.003	0.005	0.007	82	-0.006	-0.006	0.016
64	0.002	0.004	0.007	83	-0.006	-0.006	0.015
65	-0.006	-0.006	0.021	84	-0.005	-0.006	0.016
66	-0.008	-0.007	0.021	85	-0.007	-0.005	0.015
67	-0.006	-0.007	0.021	86	-0.007	-0.006	0.015
68	-0.006	-0.005	0.021	87	-0.006	-0.006	0.016
69	-0.008	-0.005	0.021	88	-0.008	-0.006	0.016
7	0.009	0.008	0.014	89	-0.010	-0.006	0.015
70	-0.006	-0.003	0.021	9	0.007	0.009	0.013
71	-0.007	-0.006	0.021	90	-0.009	-0.007	0.015
72	-0.006	-0.005	0.020	91	-0.011	-0.009	0.015
73	-0.007	-0.004	0.019	92	-0.008	-0.007	0.015
74	-0.006	-0.004	0.017	93	-0.009	-0.008	0.014
75	-0.006	-0.004	0.017	94	-0.007	-0.007	0.013
76	-0.005	-0.005	0.016	95	-0.007	-0.006	0.013
77	-0.005	-0.008	0.017	96	-0.006	-0.004	0.011
78	-0.006	-0.008	0.018	97	-0.004	-0.006	0.011
79	-0.005	-0.008	0.018	98	-0.006	-0.004	0.012
8	0.007	0.008	0.013	99	-0.005	-0.003	0.011

residuals GPS observations in [meter]				18	0.001	0.109	0.018
photo ID	rx	ry	rz	19	0.014	-0.035	-0.014
GPS drift parameter for profile 1				20	-0.002	-0.083	0.072
constant part in [meter] X -0.043 Y 0.103 Z -0.633				21	-0.068	0.016	0.053
linear part in [meter] X -0.000 Y 0.001 Z 0.008				22	-0.137	0.003	0.003
1	-0.008	-0.000	0.030	23	-0.122	-0.034	-0.003
2	0.030	0.009	-0.061	24	0.033	0.071	-0.010
3	-0.008	-0.002	-0.065	25	-0.024	0.003	-0.035
4	0.053	-0.073	-0.024	26	-0.010	0.057	-0.022
5	-0.011	0.027	-0.067	27	0.044	-0.029	0.015
6	-0.035	-0.002	-0.034	28	-0.033	0.011	-0.051
7	-0.029	0.028	-0.073	29	0.074	-0.030	0.018
8	-0.062	-0.039	0.012	30	-0.019	0.076	-0.090
9	-0.051	0.007	-0.043	31	-0.089	0.004	-0.064
10	0.082	-0.010	-0.030	32	0.125	0.019	0.011
11	0.062	0.009	0.003	33	0.076	0.030	0.075
12	0.003	0.120	0.024	34	-0.050	0.030	0.028
13	0.113	-0.075	0.064	35	-0.088	-0.073	0.015
14	-0.046	0.018	0.024	36	0.150	-0.012	0.012
15	0.023	-0.020	0.066	37	0.033	-0.046	-0.011
16	0.001	-0.018	0.064	38	0.012	-0.020	0.075
17	0.018	-0.057	0.100	39	-0.003	0.047	-0.001

40	-0.056	0.012	0.040	61	-0.026	0.035	0.010
41	0.025	0.084	0.018	62	0.028	0.084	0.029
42	0.044	0.006	0.034	63	-0.024	0.029	-0.019
43	0.049	-0.042	0.055	64	0.007	0.049	0.045
44	-0.024	0.017	0.048	GPS drift parameter for profile 2			
45	0.024	-0.020	0.052	constant part in [meter] X -0.010 Y 0.199 Z -0.102			
46	0.038	-0.023	0.014	linear part in [meter] X 0.002 Y -0.002 Z -0.002			
47	-0.081	0.043	-0.001	100	0.029	0.040	-0.003
48	-0.070	-0.017	-0.032	99	-0.006	-0.085	-0.002
49	0.022	-0.023	0.001	101	-0.043	-0.056	-0.005
50	0.030	-0.076	-0.054	98	0.009	-0.121	-0.009
51	-0.049	-0.053	-0.074	102	0.053	0.025	-0.062
52	-0.026	0.043	-0.034	97	0.157	0.108	0.027
53	-0.030	-0.029	-0.070	103	-0.009	0.015	-0.023
54	-0.017	0.070	-0.085	96	-0.024	0.036	-0.031
55	0.010	-0.015	-0.058	104	-0.042	0.002	-0.033
56	-0.022	0.017	-0.061	95	0.019	0.020	0.016
57	0.106	-0.143	0.009	105	-0.008	0.051	-0.002
58	-0.001	-0.017	0.014	94	0.012	0.060	-0.000
59	0.054	-0.058	0.002	106	-0.099	0.004	-0.045
60	-0.060	-0.013	0.030	93	0.059	-0.060	-0.024

107	-0.089	-0.006	-0.010	118	-0.026	0.021	0.032
92	-0.054	0.019	0.065	81	-0.017	0.035	0.023
108	-0.039	-0.018	-0.003	119	-0.066	0.040	0.029
91	0.029	-0.031	0.039	80	0.000	0.010	0.003
109	-0.008	-0.029	0.036	120	0.047	0.023	0.030
90	0.004	0.018	0.028	79	-0.006	0.035	-0.009
110	-0.009	-0.018	0.008	121	-0.002	-0.079	-0.017
89	-0.030	-0.068	0.008	78	0.031	-0.024	-0.062
111	-0.070	0.116	0.046	122	0.085	0.003	-0.027
88	-0.010	0.050	-0.028	77	0.088	0.023	-0.012
112	-0.027	-0.014	0.002	123	0.023	0.013	0.002
87	-0.027	0.032	-0.018	76	-0.023	0.018	-0.099
113	0.084	0.004	-0.013	124	0.009	-0.062	0.047
86	0.031	-0.039	0.007	75	-0.012	0.023	-0.108
114	0.009	-0.070	0.008	125	0.030	-0.014	0.053
85	-0.039	-0.017	0.010	74	0.031	0.082	-0.101
115	0.015	-0.017	0.006	126	0.015	-0.064	0.053
84	0.023	-0.003	0.026	73	-0.016	0.024	-0.092
116	0.064	-0.062	0.000	127	0.026	0.048	0.101
83	0.022	-0.019	0.046	72	0.059	0.094	-0.004
117	-0.070	-0.014	0.057	128	-0.093	-0.040	0.093
82	0.020	0.022	0.013	71	0.083	0.012	-0.085

70	-0.130	0.126	-0.051	141	-0.028	0.068	-0.060
69	-0.051	-0.147	-0.030	142	-0.027	0.038	-0.103
68	-0.063	0.030	0.026	143	0.037	0.025	-0.016
67	0.039	0.033	0.035	144	0.101	0.036	-0.058
66	0.037	-0.102	0.010	145	-0.033	0.113	-0.094
65	-0.034	-0.037	0.024	146	0.030	0.029	-0.059
GPS drift parameter for profile 3				147	0.028	0.024	0.046
constant part in [meter] X -0.063 Y 0.285 Z 0.184				148	-0.039	0.009	0.074
linear part in [meter] X 0.001 Y -0.001 Z -0.004				149	-0.050	-0.076	0.047
129	-0.135	-0.073	0.039	150	-0.085	-0.015	0.062
130	0.025	0.043	0.059	151	0.056	-0.064	0.028
131	0.147	-0.001	0.023	152	-0.120	-0.054	0.056
132	0.032	-0.105	-0.043	153	-0.061	-0.132	0.131
133	-0.039	-0.091	-0.014	154	-0.001	-0.013	0.063
134	0.108	0.055	-0.028	155	0.055	-0.044	0.044
135	-0.084	-0.024	0.068	156	0.010	-0.024	0.031
136	-0.039	0.039	0.004	157	0.045	0.023	-0.016
137	0.092	0.047	-0.017	158	0.017	0.018	-0.081
138	-0.004	0.027	-0.030	159	-0.096	-0.059	-0.080
139	-0.041	0.038	0.005	160	0.132	0.049	-0.042
140	-0.037	0.001	-0.024	161	-0.020	0.036	-0.007

162	0.022	0.053	-0.009
GPS drift parameter for profile 4			
constant part in [meter]	X	0.013	Y 0.445 Z 0.189
linear part in [meter]	X	0.002	Y 0.037 Z 0.005
163	-0.064	0.038	-0.054
164	0.032	-0.003	-0.013
165	0.011	-0.011	0.012
166	0.030	-0.003	0.035
167	0.067	-0.054	0.006
168	-0.037	0.011	0.030
169	-0.043	-0.009	0.037
170	-0.030	0.059	-0.014
171	0.046	-0.047	-0.029
172	-0.011	-0.012	0.035
173	0.014	0.021	-0.005
174	-0.016	0.010	-0.041

GPS drift parameter for profile 5

constant part in [meter] X 0.133 Y -0.035 Z 0.264

linear part in [meter] X -0.010 Y 0.014 Z -0.001

189	-0.020	-0.015	-0.001
190	-0.025	-0.037	-0.009
191	-0.079	-0.011	0.054

192	0.108	0.078	0.032
193	0.042	-0.041	0.020
194	-0.032	-0.003	-0.047
195	-0.090	0.039	-0.003
196	0.027	-0.041	-0.018
197	0.004	-0.006	0.016
198	0.020	0.078	-0.010
199	-0.010	-0.074	0.000
200	0.062	0.107	0.003
201	0.021	0.016	-0.052
202	0.034	-0.016	-0.039
203	-0.005	-0.036	-0.054
204	0.033	0.017	0.030
205	0.027	-0.059	-0.033
206	-0.016	-0.054	0.029
207	-0.057	0.018	0.058
208	-0.045	0.040	0.025

GPS drift parameter for profile 6

constant part in [meter] X 0.077 Y 0.029 Z 0.457

linear part in [meter] X -0.009 Y 0.020 Z -0.004

209	-0.052	-0.046	-0.003
210	0.015	0.012	-0.093

211	0.017	0.023	-0.007	229	-0.025	-0.052	-0.001
212	0.030	0.004	0.055	230	-0.140	0.056	-0.032
213	-0.007	0.003	0.046	231	-0.053	-0.068	-0.065
214	0.030	0.004	0.019	232	-0.093	-0.042	-0.026
215	0.009	-0.019	0.004	233	0.000	-0.007	-0.045
216	-0.010	0.043	0.022	234	-0.038	0.007	0.015
217	-0.023	0.019	0.012	235	-0.062	-0.095	-0.043
218	-0.061	-0.020	0.031	236	0.033	-0.085	0.017
219	0.084	0.005	-0.062	237	-0.000	0.022	-0.067
220	-0.033	-0.029	-0.026	238	-0.007	-0.019	-0.030
GPS drift parameter for profile 7				239	0.066	0.018	0.035
constant part in [meter] X 0.205 Y 0.018 Z 0.474				240	0.050	-0.007	-0.015
linear part in [meter] X -0.001 Y -0.004 Z 0.004				241	-0.013	-0.008	0.050
221	0.031	0.020	0.033	242	-0.054	0.034	-0.007
222	0.016	-0.012	0.036	243	-0.003	-0.073	0.006
223	0.041	-0.014	0.005	244	0.003	-0.032	-0.042
224	0.194	-0.051	0.066	245	-0.027	0.061	-0.042
225	-0.069	0.193	0.061	246	-0.016	0.013	-0.026
226	0.188	0.085	-0.047	247	-0.025	0.021	0.020
227	-0.081	-0.037	0.049	248	-0.094	-0.089	0.016
228	0.001	0.041	-0.031	249	0.041	0.077	-0.000

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250	-0.098	0.030	0.001	101	325595.905	4420635.388	4226.626	-0.1355	0.3110	-172.7317
251	0.039	-0.118	0.038	102	324399.218	4420486.842	4225.459	-0.1480	0.3121	-172.7337
252	-0.051	-0.016	0.062	103	323197.435	4420346.609	4224.968	-0.2258	0.2992	-172.7979
253	0.011	0.043	0.000	104	321991.810	4420191.043	4224.371	-0.1649	0.2997	-172.8152
254	-0.005	-0.070	-0.022	105	320792.826	4420042.269	4225.021	-0.2015	0.2930	-172.6489
255	0.025	-0.019	-0.001	106	319591.746	4419894.342	4224.327	-0.1762	0.3082	-172.7390
256	0.090	0.097	-0.005	107	318392.038	4419743.282	4225.224	-0.2716	0.2818	-172.7603
257	0.129	0.094	0.038	108	317192.672	4419599.957	4225.364	-0.1608	0.3106	-172.7843
mean standard deviations of terrain points				109	315992.513	4419455.800	4225.880	-0.1914	0.3021	-172.6775
x	0.023 [meter]			11	304773.545	4421426.826	4235.089	0.1581	-0.2871	7.3341
y	0.028 [meter]			110	314786.891	4419309.073	4226.806	-0.1910	0.2989	-172.7920
z	0.064 [meter]			111	313583.198	4419169.831	4226.854	-0.2145	0.2915	-172.7695
max standard deviations of terrain points				112	312384.967	4419025.639	4225.492	-0.1663	0.3076	-172.7301
x	0.066 [meter] at point	40001130		113	311186.009	4418875.136	4223.978	-0.1992	0.3065	-172.7176
y	0.105 [meter] at point	30000911		114	309985.832	4418727.399	4223.872	-0.1731	0.3006	-172.7169
z	0.310 [meter] at point	50000241		115	308779.180	4418574.653	4224.484	-0.1932	0.2836	-172.7336
exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg])				116	307580.455	4418428.282	4226.024	-0.1645	0.3018	-172.6704
rotations from terrain to photo (rotated axes)				117	306378.455	4418271.031	4226.092	-0.0172	0.0726	-172.8290
photo ID	px	py	pz	omega	phi	kappa				
1	292773.215	4419939.666	4232.353	0.1341	-0.2795	7.4287	118	305185.621	4418130.200	4226.596
							119	303984.055	4417984.875	4225.939
10	303579.010	4421279.733	4234.778	0.1564	-0.2932	7.2452	12	305981.639	4421575.245	4234.001
							120	302778.852	4417848.098	4225.965
100	326799.834	4420795.448	4226.913	-0.1694	0.2899	-172.7367				

121	301580.881	4417688.688	4226.949	-0.2646	0.2627	-172.7878
122	300374.854	4417549.248	4226.244	-0.2111	0.2883	-172.6836
123	299174.095	4417408.738	4225.290	-0.1862	0.3045	-172.7575
124	297973.346	4417255.688	4226.645	-0.2042	0.2910	-172.7611
125	296773.556	4417092.930	4225.660	-0.1034	0.3065	-172.8178
126	295578.539	4416951.769	4226.002	-0.1983	0.3081	-172.7879
127	294366.714	4416807.294	4226.411	-0.1966	0.2738	-172.7099
128	293170.674	4416670.596	4225.941	-0.2801	0.2818	-172.6071
129	363502.907	4425166.949	4348.554	0.0989	-0.3194	-5.3656
13	307178.904	4421731.986	4233.006	0.1592	-0.2911	7.3164
130	364772.544	4425048.741	4350.123	0.1331	-0.3132	-5.3498
131	366043.329	4424920.862	4347.703	0.0811	-0.3097	-5.3708
132	367309.990	4424787.885	4348.398	0.1048	-0.3247	-5.2382
133	368577.026	4424670.015	4349.226	0.1100	-0.3255	-5.3522
134	369855.542	4424562.216	4349.561	-0.0174	0.2229	-5.5506
135	371117.353	4424425.804	4350.918	0.1163	-0.3323	-5.3552
136	372384.669	4424295.779	4349.330	0.1532	-0.3380	-5.3006
137	373663.822	4424170.916	4349.014	0.1372	-0.3234	-5.3730
138	374932.542	4424048.242	4350.710	0.1456	-0.3256	-5.3559
139	376191.442	4423923.000	4351.455	0.1245	-0.3340	-5.3267
14	308374.759	4421885.889	4233.561	0.1662	-0.2684	7.2529

140	377469.369	4423802.771	4347.932	0.1488	-0.3474	-5.3867
141	378743.616	4423677.442	4349.442	0.1210	-0.3232	-5.3433
142	380001.444	4423546.079	4350.327	0.1192	-0.3120	-5.3155
143	381269.335	4423416.752	4348.977	0.1358	-0.3186	-5.3810
144	382536.452	4423281.545	4349.324	0.1126	-0.3145	-5.3340
145	383813.863	4423159.555	4352.209	0.0737	-0.3202	-5.3972
146	385081.398	4423038.438	4350.212	0.1180	-0.3128	-5.4017
147	386344.746	4422920.275	4351.835	0.0969	-0.3166	-5.3817
148	387622.090	4422773.441	4352.120	0.0746	-0.3018	-5.2582
149	388884.736	4422643.352	4351.921	0.1372	-0.3124	-5.4326
15	309578.533	4422031.704	4233.582	-0.0133	-0.1346	7.1451
150	390152.997	4422516.058	4351.141	0.0888	-0.3156	-5.4186
151	391428.810	4422404.662	4351.295	0.0865	-0.3185	-5.4664
152	392692.193	4422274.645	4351.427	0.1284	-0.3381	-5.3864
153	393968.164	4422146.189	4351.631	0.1469	-0.3276	-5.2943
154	395230.052	4422028.685	4351.490	0.1000	-0.3242	-5.3822
155	396502.978	4421907.572	4352.759	0.0798	-0.3174	-5.4547
156	397767.937	4421769.734	4352.391	0.1643	-0.3315	-5.3587
157	399037.701	4421650.621	4351.225	0.0995	-0.3310	-5.3530
158	400304.031	4421531.885	4352.385	0.1371	-0.3184	-5.3439
159	401579.900	4421409.888	4352.532	0.1191	-0.3247	-5.3764

16	310783.868	4422158.337	4234.680	0.2609	-0.0594	7.1840	192	426808.765	4427203.168	4357.971	-0.1936	0.2859	-169.4166
160	402849.083	4421288.975	4352.637	0.1174	-0.3347	-5.3669	193	425554.511	4426978.760	4356.919	-0.1305	0.2935	-169.3311
161	404116.301	4421153.173	4353.273	0.1130	-0.3165	-5.3845	194	424301.573	4426747.552	4355.953	-0.2632	0.2755	-169.2798
162	405386.344	4421018.974	4352.258	0.0992	-0.3199	-5.3526	195	423048.459	4426519.544	4355.685	-0.1893	0.2933	-169.3503
163	401700.249	4422760.651	4362.499	0.4001	-0.3730	-32.8201	196	421789.010	4426290.315	4356.467	-0.2964	0.2477	-169.3577
164	402760.217	4422057.816	4363.350	-0.1132	-0.3036	-32.7762	197	420528.618	4426056.648	4355.705	-0.1792	0.2781	-169.3620
165	403834.746	4421361.328	4365.012	-0.0283	-0.3506	-32.7729	198	419280.873	4425828.524	4356.640	-0.1791	0.2844	-169.3565
166	404901.065	4420669.289	4361.333	-0.0609	-0.3457	-32.7088	199	418027.019	4425604.370	4358.343	-0.2263	0.2606	-169.3846
167	405972.258	4419971.360	4365.632	0.0324	-0.3848	-32.6330	2	293965.554	4420096.985	4233.391	0.2985	-0.2759	7.2435
168	407036.137	4419266.082	4362.209	-0.1126	-0.2798	-32.5434	20	315587.289	4422741.895	4233.448	0.1846	-0.2880	7.2480
169	408103.726	4418580.077	4356.633	-0.0848	-0.3159	-32.7802	200	416774.710	4425379.438	4354.213	-0.2170	0.2904	-169.2007
17	311980.957	4422292.070	4235.052	0.1809	-0.2934	7.3498	201	415521.615	4425141.799	4354.246	-0.2146	0.2603	-169.3517
170	409176.524	4417887.268	4361.305	-0.0785	-0.3119	-32.8087	202	414263.948	4424905.581	4354.526	-0.1655	0.2856	-169.3371
171	410248.935	4417189.383	4368.608	-0.0152	-0.3060	-32.7141	203	413014.570	4424678.130	4354.865	-0.2199	0.2697	-169.3192
172	411311.615	4416494.336	4364.710	-0.0241	-0.3621	-32.6890	204	411755.451	4424460.027	4354.123	-0.2316	0.2632	-169.2947
173	412386.585	4415800.968	4374.269	-0.0754	-0.2730	-32.8197	205	410503.283	4424219.591	4353.673	-0.1953	0.2811	-169.3911
174	413450.617	4415107.217	4366.655	-0.0206	-0.3652	-32.8058	206	409249.668	4423994.752	4353.333	-0.2115	0.2711	-169.3831
18	313181.974	4422452.492	4233.929	0.1713	-0.2858	7.2439	207	407990.022	4423780.782	4354.778	-0.1775	0.2830	-169.2773
189	430572.196	4427893.066	4356.544	-0.1416	0.2926	-169.3625	208	406732.807	4423541.124	4352.612	-0.1529	0.2930	-169.4135
19	314385.350	4422596.317	4233.912	0.2766	-0.2903	7.3232	209	416195.468	4428533.386	4357.730	0.1178	-0.2701	10.6671
190	429316.927	4427662.883	4356.394	-0.2275	0.2701	-169.4036	21	316786.720	4422886.273	4234.241	0.2319	-0.2819	7.1933
191	428063.335	4427428.543	4357.537	0.2983	-0.0348	-169.3063	210	417446.069	4428765.392	4355.967	0.2670	-0.2372	10.6355

211	418706.834	4429007.720	4356.918	0.2096	-0.2565	10.5711
212	419956.542	4429232.942	4358.287	0.1567	-0.2798	10.6809
213	421204.510	4429474.732	4355.995	1.1478	-1.1530	10.5584
214	422468.751	4429697.321	4356.199	0.1825	-0.2690	10.7094
215	423719.880	4429936.192	4354.911	0.2030	-0.2821	10.6721
216	424968.510	4430166.085	4353.740	-0.1457	0.3725	10.6501
217	426224.114	4430383.893	4356.871	0.2283	-0.2690	10.5802
218	427482.452	4430602.580	4356.490	0.0240	-0.5163	10.7555
219	428739.446	4430842.348	4355.359	0.1478	-0.2873	10.6293
22	317985.928	4423025.576	4234.356	-0.2272	-0.7127	7.4193
220	429997.482	4431062.677	4355.707	0.2202	-0.2689	10.5840
221	409529.628	4424040.694	4347.176	-0.3772	-0.0527	174.6671
222	408259.316	4424169.550	4347.697	-0.1184	0.3273	174.6858
223	406991.012	4424299.242	4347.131	-0.0763	0.3259	174.6945
224	405723.544	4424414.194	4348.464	-0.1105	0.3070	174.7071
225	404450.287	4424542.856	4347.884	-0.1115	0.3303	174.6756
226	403186.269	4424660.665	4347.903	-0.0578	0.2957	174.7108
227	401913.817	4424785.145	4346.258	-0.0375	0.3191	174.6756
228	400646.224	4424916.117	4346.611	-0.3200	0.0241	174.6509
229	399379.551	4425042.030	4348.131	-0.0756	0.3292	174.7213
23	319191.027	4423184.573	4233.838	0.1822	-0.2909	7.2291

230	398104.355	4425166.686	4347.398	-0.0786	0.3182	174.6790
231	396842.017	4425301.895	4347.347	-0.1087	0.3325	174.7134
232	395570.903	4425416.253	4346.583	-0.1275	0.3370	174.6390
233	394297.267	4425551.828	4346.044	-0.0959	0.3232	174.6279
234	393028.423	4425670.222	4344.717	-0.1517	0.3352	174.5966
235	391759.626	4425801.571	4345.165	-0.2007	0.3278	174.6765
236	390493.918	4425911.384	4346.323	-0.1368	0.3145	174.6325
237	389222.668	4426057.689	4345.226	-0.5141	-0.1982	174.6366
238	387958.203	4426189.028	4342.979	-0.1051	0.3507	174.6190
239	386689.519	4426317.477	4346.502	-0.0865	0.3268	174.7457
24	320387.850	4423333.776	4233.849	0.1817	-0.2924	7.3053
240	385416.650	4426426.539	4344.441	-0.0498	0.3201	174.6338
241	384148.940	4426552.682	4343.573	-0.4631	-0.0011	174.8640
242	382876.285	4426670.691	4347.092	0.3500	-0.2504	174.5462
243	381605.713	4426810.296	4346.485	-0.0158	0.3253	174.7280
244	380343.635	4426931.647	4345.075	-0.0275	0.3362	174.6714
245	379073.540	4427067.755	4345.807	-0.1925	0.3288	174.6495
246	377804.000	4427186.248	4346.306	-0.1571	0.3058	174.6712
247	376535.957	4427306.922	4347.933	-0.1016	0.3104	174.7136
248	375261.695	4427420.541	4346.070	-0.0869	0.3303	174.6905
249	373994.531	4427546.666	4344.065	-0.0992	0.3168	174.7074

25	321593.527	4423488.033	4233.918	0.2158	-0.2889	7.2513	38	337203.176	4425405.989	4233.922	0.1905	-0.2973	7.3651
250	372725.445	4427677.092	4343.912	-0.0587	0.3198	174.6993	39	338400.602	4425557.849	4233.904	0.1989	-0.2980	7.2542
251	371454.026	4427807.489	4343.113	-0.0791	0.3367	174.6496	4	296375.463	4420388.738	4234.483	0.6905	0.4872	7.1222
252	370186.993	4427930.384	4342.047	-0.1053	0.3258	174.6915	40	339597.985	4425702.157	4235.091	0.2178	-0.2880	7.2999
253	368914.359	4428045.736	4346.919	-0.0982	0.3130	174.7134	41	340804.836	4425849.573	4235.444	0.1488	-0.2754	7.2564
254	367648.359	4428158.991	4345.146	-0.1206	0.3011	174.6149	42	342001.705	4426007.595	4235.085	-0.0119	-0.0044	7.0670
255	366378.880	4428309.753	4344.999	1.3914	-1.7944	174.8002	43	343210.060	4426141.815	4236.520	0.1969	-0.2781	7.2433
256	365112.086	4428432.031	4343.588	-0.0268	0.3557	174.6446	44	344406.648	4426283.130	4236.272	0.1206	-0.2966	7.2326
257	363843.614	4428576.007	4340.484	-10.6502	3.3167	174.8633	45	345609.927	4426429.675	4235.790	0.2094	-0.2801	7.2082
26	322787.192	4423634.749	4233.539	0.1470	-0.2936	7.2992	46	346808.576	4426575.698	4236.561	0.2055	-0.2859	7.3505
27	323990.050	4423778.433	4233.976	0.1855	-0.2931	7.1843	47	348010.783	4426735.125	4235.951	0.0762	-0.1333	7.3480
28	325192.867	4423929.833	4234.012	0.1925	-0.2996	7.2113	48	349205.382	4426883.692	4235.833	0.2007	-0.2827	7.2184
29	326392.917	4424082.001	4233.895	0.1657	-0.3043	7.3008	49	350408.245	4427022.300	4235.810	0.2090	-0.2786	7.2754
3	295169.528	4420244.424	4233.765	0.1747	-0.2809	7.2590	5	297568.348	4420542.545	4233.901	0.1757	-0.3007	7.1887
30	327593.361	4424244.196	4233.718	0.3722	-0.5647	7.1463	50	351612.887	4427167.247	4235.693	0.1660	-0.2925	7.2646
31	328793.135	4424373.960	4233.348	0.2119	-0.3113	7.2531	51	352810.047	4427316.882	4235.190	0.1961	-0.2883	7.2890
32	330000.075	4424500.160	4234.636	0.5287	0.1527	7.3212	52	354018.841	4427465.162	4235.271	0.1702	-0.2854	7.3498
33	331202.862	4424646.702	4234.419	0.1079	-0.3099	7.3277	53	355217.221	4427620.044	4235.555	0.1782	-0.2885	7.2850
34	332404.569	4424800.003	4234.944	0.1694	-0.2911	7.3022	54	356417.076	4427776.263	4236.055	0.2387	-0.2918	7.1860
35	333593.022	4424965.544	4234.161	1.8849	-1.9207	7.0617	55	357615.756	4427919.317	4235.825	0.2021	-0.2918	7.2968
36	334805.683	4425100.788	4234.247	0.1811	-0.1767	7.3455	56	358816.501	4428050.427	4236.201	0.0837	-0.2906	7.2212
37	336004.252	4425251.061	4233.243	0.1777	-0.3024	7.2644	57	360016.373	4428188.603	4236.784	0.3826	-0.1616	7.3854

58	361218.053	4428344.520	4236.797	0.2173	-0.3047	7.2534	77	354417.268	4424180.434	4226.942	-0.2108	0.2791	-172.7891
59	362420.102	4428500.481	4236.820	0.1691	-0.3044	7.2361	78	353220.452	4424038.798	4226.194	-0.2084	0.2937	-172.6947
6	298770.472	4420689.070	4234.739	0.1701	-0.2911	7.2365	79	352019.603	4423888.700	4225.371	-0.1889	0.2878	-172.7392
60	363624.520	4428655.763	4237.109	0.1781	-0.3016	7.2204	8	301178.226	4420998.646	4234.221	0.1133	-0.2902	7.2675
61	364818.798	4428793.537	4237.091	0.2144	-0.2911	7.2493	80	350815.118	4423740.225	4225.080	-0.1858	0.3000	-172.7509
62	366027.619	4428933.287	4237.349	0.2232	-0.2919	7.1568	81	349610.997	4423592.734	4225.040	-0.1709	0.2936	-172.6817
63	367225.551	4429085.977	4237.345	0.1799	-0.3115	7.2798	82	348413.200	4423449.903	4223.416	-0.2655	0.2766	-172.5861
64	368426.507	4429245.604	4237.228	0.1706	-0.3018	7.2622	83	347210.017	4423301.560	4226.899	-0.1965	0.2565	-172.7617
65	368831.390	4425951.312	4227.444	-0.2481	0.4075	-172.7868	84	346015.000	4423153.000	4226.311	-0.1975	0.3062	-172.7363
66	367630.578	4425810.216	4227.652	-0.1781	0.3087	-172.7585	85	344808.661	4422982.146	4224.835	-0.0807	0.0908	-172.8526
67	366429.183	4425660.636	4226.564	-0.3199	0.3117	-172.6464	86	343612.391	4422849.226	4225.506	-0.2770	0.2729	-172.7099
68	365220.619	4425520.837	4227.667	-0.2565	0.2807	-172.5613	87	342407.857	4422708.982	4225.659	-0.1819	0.2996	-172.6510
69	364026.103	4425368.693	4227.440	-0.1771	0.2932	-172.7539	88	341210.579	4422560.569	4225.030	-0.0867	0.3148	-172.6771
7	299972.759	4420851.506	4234.464	0.2627	-0.2457	7.2071	89	340001.630	4422410.357	4224.891	-0.2485	0.2853	-172.7814
70	362823.904	4425219.951	4226.210	-0.1728	0.2961	-172.7420	9	302376.911	4421134.709	4234.721	0.2153	-0.2864	7.1988
71	361622.141	4425072.740	4227.021	-0.0787	0.3161	-172.6932	90	338802.621	4422278.674	4225.803	-0.3504	0.0328	-172.5349
72	360423.822	4424924.196	4227.152	-0.1793	0.2886	-172.6944	91	337606.130	4422116.756	4225.435	-0.1939	0.3026	-172.8127
73	359217.282	4424774.185	4225.636	-0.2414	0.2687	-172.5994	92	336407.296	4421974.754	4226.219	-0.2354	0.2834	-172.4036
74	358021.402	4424625.473	4225.168	-0.2176	0.2912	-172.7750	93	335205.021	4421819.551	4225.947	-0.2522	0.2891	-172.6732
75	356820.130	4424474.627	4225.811	-0.1480	0.2999	-172.7130	94	334002.455	4421667.120	4225.028	-0.2002	0.2729	-172.7354
76	355614.768	4424337.569	4226.836	-0.3423	-0.0515	-172.7710	95	332798.641	4421528.238	4223.654	-0.1709	0.2859	-172.7102

96	331601.988	4421392.142	4223.850	-0.1862	0.2909	-172.6215	Atmospheric correction	: ON
97	330394.169	4421236.123	4224.858	-0.1704	0.2985	-172.6575	Do not eliminate manual points	: OFF
98	329201.297	4421088.924	4226.002	-0.2072	0.2945	-172.7651	Do not eliminate GNSS	: ON
99	327997.183	4420942.038	4226.398	-0.2162	0.2982	-172.7791	Standard deviations (a-priori) :	
Start Post Processing: Mon Aug 19 10:58:07 2019							-----	
=====							Ground control (planimetry) [m]	
Active Block : complete Block							Set	
Number of photos : 14							0 (=default)	: 0.050
Number of strips : 1							Ground control (height) [m]	
Photo scale : 1:48522							Set	
Mean terrain height [m] : 490							0 (=default)	: 0.148
Automatic blunder detection : OFF							Automatic image points [mm]	
Use all adjusted points in project file							Set	
as control (absolute mode) : OFF							0 (=default)	: 0.002
Control parameter for block adjustment :							Image points of ground control and manual measurements [mm]	: 0.002
-----							GNSS	X Y Z [m] : 0.100 0.100 0.100
Selfcalibration : OFF							INS	omega phi kappa [deg] : 0.008 0.008 0.008
GNSS-Mode : ON							Used Cameras in block:	
Drift-Mode : OFF							-----	
IMU-Mode : ON							1 Eagle	
IMU-Boresight : OFF							Distortion	: No correction
Earth's curvature correction : ON							List of observations with status deactivated	

-----			sigma naught	0.7 micron (10:58:08)
hz control point	1073		found	148 points connecting 2 photos
ve control point	1073		found	277 points connecting 3 photos
Tie Point Generator			number of observations	2356
-----			number of unknowns	1359
created	46 observations for photo	175	redundancy	997
created	81 observations for photo	176	RMS automatic points in photo (number: 1110)	
created	101 observations for photo	177	x	0.2 micron
created	96 observations for photo	178	y	0.5 micron
created	88 observations for photo	179	RMS control and manual points in photo (number: 17)	
created	93 observations for photo	180	x	0.9 micron
created	92 observations for photo	181	y	0.9 micron
created	91 observations for photo	182	RMS control points with default standard deviation set (number: 6)	
created	84 observations for photo	183	x	0.017 [meter]
created	71 observations for photo	184	y	0.026 [meter]
created	68 observations for photo	185	RMS control points with default standard deviation set (number: 6)	
created	77 observations for photo	186	z	0.078 [meter]
created	82 observations for photo	187	RMS IMU observations (number: 14)	
created	57 observations for photo	188	omega	0.001 [deg]
total of 1127 measurements in 14 photos are used for adjustment (total 14 photos)			phi	0.007 [deg]
sigma naught	2.1 micron (10:58:08)		kappa	0.007 [deg]

RMS GNSS observations (number: 14)

x 0.022 [meter]

y 0.016 [meter]

z 0.021 [meter]

sigma naught 0.7 micron (10:58:08)

standard deviations of exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg/1000])

photo ID	px	py	pz	omega	phi	kappa
175	0.030	0.029	0.020	0.42958	0.52285	0.49992
176	0.028	0.026	0.017	0.40595	0.44170	0.36570
177	0.028	0.026	0.016	0.42114	0.44859	0.35349
178	0.028	0.026	0.016	0.42158	0.44695	0.39906
179	0.029	0.027	0.016	0.44245	0.46418	0.42819
180	0.029	0.027	0.016	0.44948	0.46003	0.39115
181	0.029	0.027	0.016	0.44916	0.46347	0.39339
182	0.029	0.027	0.017	0.44887	0.45962	0.42440
183	0.030	0.028	0.017	0.45607	0.49079	0.45809
184	0.029	0.028	0.017	0.46742	0.48387	0.44240
185	0.030	0.028	0.017	0.45471	0.50807	0.44077
186	0.029	0.027	0.017	0.44009	0.49467	0.43150
187	0.029	0.028	0.018	0.44965	0.48630	0.44000
188	0.031	0.029	0.021	0.46254	0.55128	0.56756

mean standard deviations of rotations

omega 0.4 [deg/1000]

phi 0.5 [deg/1000]

kappa 0.4 [deg/1000]

max standard deviations of rotations

omega 0.5 [deg/1000] at photo 184

phi 0.6 [deg/1000] at photo 188

kappa 0.6 [deg/1000] at photo 188

mean standard deviations of translations

x 0.029 [meter]

y 0.027 [meter]

z 0.017 [meter]

max standard deviations of translations

x 0.031 [meter] at photo 188

y 0.029 [meter] at photo 188

z 0.021 [meter] at photo 188

residuals horizontal control points in [meter]

control point ID	rx	ry
1064	-0.012	0.017
1066	-0.006	-0.000
1068	0.017	0.023
1070	0.014	-0.055

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Línea Ferroviaria de Alta Velocidad Madrid – Extremadura. Tramo: Madrid - Oropesa							
residuals vertical control points in [meter]	1074	-0.015	0.012		184	0.001	-0.007 0.005
	1077	0.027	0.009		185	0.002	-0.006 0.003
					186	0.000	-0.005 0.002
	control point ID	rz			187	-0.000	-0.005 0.002
	1064	0.162			188	-0.002	-0.005 0.001
	1066	0.011			residuals GNSS observations in [meter]		
	1068	0.048			photo ID	rx	ry rz
	1070	0.046			175	-0.024	-0.005 0.034
	1074	-0.067			176	0.010	0.003 -0.013
	1077	0.036			177	0.000	0.028 -0.016
residuals IMU observations in [deg]					178	-0.002	0.019 0.008
	photo ID	omega	phi	kappa	179	0.021	0.010 -0.006
	175	-0.001	-0.007	0.007	180	-0.005	0.010 -0.023
	176	-0.001	-0.008	0.008	181	0.005	-0.040 0.026
	177	-0.002	-0.007	0.009	182	0.065	0.002 0.018
	178	-0.002	-0.007	0.009	183	-0.015	0.004 0.003
	179	-0.002	-0.007	0.009	184	0.032	-0.013 0.014
	180	-0.000	-0.007	0.009	185	-0.007	0.007 -0.006
	181	-0.000	-0.007	0.009	186	0.002	-0.012 0.026
	182	0.002	-0.008	0.009	187	0.017	-0.005 0.047
	183	0.001	-0.006	0.007	188	-0.002	0.016 -0.005

max standard deviations of terrain points			186	437229.041	4422213.764	4369.793	-0.18310	0.94242	15.10687
x	0.066 [meter] at point	30000194	187	438459.461	4422537.605	4360.761	0.18340	-0.28085	15.20253
y	0.105 [meter] at point	30000363	188	439704.575	4422868.220	4350.937	0.16748	-0.30018	15.23623
z	0.158 [meter] at point	30000363	=====						
mean standard deviations of terrain points			Sigma naught : 0.7 [micron] = 0.1 [pixel in level 0]						
x	0.031								
y	0.046								
z	0.102								
exterior orientation parameters (px, py, pz in [meter] omega,phi,kappa in [deg])									
rotations from terrain to photo (rotated axes)									
photo ID	px	py	pz	omega	phi	kappa			
175	423681.246	4418592.510	4363.441	0.14339	-0.27357	15.25101			
176	424905.444	4418921.994	4353.274	0.21724	-0.23906	15.35141			
177	426149.540	4419244.460	4360.273	-0.13048	0.10286	15.24871			
178	427376.416	4419572.551	4360.666	0.23432	-0.25488	15.18915			
179	428605.394	4419905.030	4363.140	0.21200	-0.24516	15.18056			
180	429839.900	4420229.777	4360.486	0.21871	-0.25199	15.16605			
181	431073.810	4420572.751	4364.955	1.29620	-1.18766	15.16087			
182	432302.473	4420891.983	4360.767	0.21066	-0.26349	15.26836			
183	433539.332	4421216.640	4363.578	0.17163	-0.26427	15.25127			
184	434765.414	4421557.074	4364.752	0.30335	-0.20603	15.18943			
185	436000.633	4421891.176	4372.359	0.26527	-0.23784	15.32047			

13. APÉNDICE 7: RESTITUCIÓN. LISTADO DE CÓDIGOS

Cód ig o	LISTADO DE CÓDIGOS DE RESTITUCIÓN		
	Elemento	Tipo	Símbolo
101	curva directora	Nivel	-
102	curva normal	Nivel	-
103	curva depresión directora	Nivel	-
104	curva depresión normal	Nivel	-
105	cota curva	Texto	-
106	punto acotado	Punto	-
107	cota izquierda	Texto	-
108	cabeza talud	Planim	-
109	pie talud	Planim	-

Código	Elemento	Tipo	Símbolo
		m	
110	escarpado	Planim	-
111	afloramiento rocas	Planim	-
112	escombrera	Planim	-
113	zanja	Planim	-
114	cueva	Planim	-
201	carretera	Planim	-
202	carretera abandonada	Planim	-
203	autovía/autopista	Planim	-
204	borde de asfalto	Planim	-
205	camino	Planim	-
206	acera	Planim	-
207	bordillo	Planim	-
208	guardarrail metálico	Planim	-
209	guardarrail obra	Planim	-
210	señalización horizontal	Planim	-
211	señalización vertical	Símbolo	2211
212	viales en construcción	Planim	-
250	ffcc	Planim	-

Código	Elemento	Tipo	Símbolo
251	ffcc abandonado	Planim	-
252	andén	Planim	-
253	poste catenaria	Símbolo	2253
254	cabeza balasto	Planim	-
255	pie balasto	Planim	-
256	raíles	Planim	-
257	armario	Planim	-
258	señalización horizontal	Planim	-
301	edificación	Planim	-
302	divisiones casa	Planim	-
303	edificio singular	Planim	-
304	caseta	Planim	-
305	nave	Planim	-
306	patio	Planim	-
307	porche/marquesina	Planim	-
308	ruinas	Planim	-
309	aparcamiento cubierto	Planim	-
310	cementerio	Planim	-
311	chimenea	Planim	-
312	depósito elevado, silo	Planim	-

Código	Elemento	Tipo	Símbolo
313	depósito nivel	Planim	-
314	edificio en construcción	Planim	-
315	elemento sin identificar	Planim	-
316	escalera	Planim	-
317	estructura en general	Planim	-
318	monumento	Planim	-
319	invernadero	Planim	-
320	transformador	Planim	-
321	instalaciones	Planim	-
341	alambrada o cerca metálica	Planim	-
342	muro, pared, tapia	Planim	-
343	muro de contención	Planim	-
344	muralla	Planim	-
351	obra de fábrica	Planim	-
352	puente de hormigón	Planim	-
353	puente metálico	Planim	-
354	paso inferior/superior	Planim	-
355	plataforma hormigón	Planim	-
356	boca de túnel	Planim	-
357	boca de metro	Planim	-

Código	Elemento	Tipo	Símbolo
358	azud	Planim	-
359	dique	Planim	-
360	pasarela	Planim	-
361	presa	Planim	-
362	gradas	Planim	-
363	líneas catastrales	Planim	-
401	aerogenerador	Símbolo	2401
402	antena	Símbolo	2402
403	conducción subterránea	Planim	-
404	conducción superficie	Planim	-
405	farola	Símbolo	2405
406	tubería en general	Planim	-
407	línea eléctrica	Planim	-
408	mojón	Símbolo	2408
409	poste	Símbolo	2409
410	poste teleférico/funicular	Planim	-
411	punto kilométrico	Símbolo	2411
412	punto kilométrico	Texto	-
413	registro	Planim	-

Código	Elemento	Tipo	Símbolo
414	registro circular	Símbolo	2414
415	registro cuadrado	Símbolo	2415
416	semáforo	Símbolo	2416
417	subestación eléctrica	Planim	-
418	sumidero	Planim	-
419	sumidero	Símbolo	2419
420	teleférico/funicular	Planim	-
421	torre metálica	Planim	-
422	torre metálica	Símbolo	2422
423	baliza	Planim	-
424	baliza	Símbolo	2424
425	barandilla	Planim	-
426	báscula	Planim	-
427	campo deportes	Planim	-
428	cartel informativo/publicitario	Planim	2428
429	mobiliario urbano	Planim	-
430	paso con barrera	Planim	2430
431	pórticos y banderolas	Planim	2431
432	kiosko	Planim	-

Código	Elemento	Tipo	Símbolo
433	banco	Planim	-
434	instalación fotovoltaica	Planim	-
501	parcela	Planim	-
502	división cultivo	Planim	-
503	masa árboles	Planim	-
504	árbol	Símbolo	2504
505	alcorque	Planim	-
506	palmera	Símbolo	2506
507	jardín	Planim	-
508	seto	Planim	-
509	cortafuegos	Planim	-
510	Er	Texto	-
511	Fr	Texto	-
512	H	Texto	-
513	J	Texto	-
514	Ma	Texto	-
515	Mb	Texto	-
516	Na	Texto	-
517	O	Texto	-
518	Pd	Texto	-

Código	Elemento	Tipo	Símbolo
519	Rpf	Texto	-
520	Tc	Texto	-
521	V	Texto	-
601	abrevadero	Planim	-
602	acequia de tierra	Planim	-
603	acequia obra	Planim	-
604	acueducto	Planim	-
605	balsa de obra/estanque	Planim	-
606	balsa de tierra/charca	Planim	-
607	canal de obra	Planim	-
608	canal de tierra	Planim	-
609	cuneta de obra	Planim	-
610	cuneta de tierra	Planim	-
611	depuradora	Planim	-
612	desagüe	Planim	-
613	embalse	Planim	-
614	fuelle	Planim	-
615	lago	Planim	-
616	línea de costa	Planim	-
617	muelle-puerto-embarcadero	Planim	-

Código	Elemento	Tipo	Símbolo
618	piscina	Planim	-
619	piscina exterior	Planim	-
620	pozo	Planim	-
621	pozo	Símbolo	2621
622	rambla	Planim	-
623	río/arroyo	Planim	-
624	salinas	Planim	-
625	vaguada	Planim	-
701	límite autonómico	Planim	-
702	límite de municipio	Planim	-
703	límite nación	Planim	-
704	límite provincia	Planim	-
705	límite de zona	Planim	-
801	cuadrícula	Símbolo	2801
802	cuadrícula	Texto	-
803	punto de apoyo	Símbolo	2803
804	punto de apoyo	Texto	-
805	vértice geodésico	Símbolo	2805
806	vértice geodésico	Texto	-

Código	Elemento	Tipo	Símbolo
807	vértice red básica	Símbolo	2807
808	vértice red básica	Texto	-
901	hidrografía	Texto	-
902	callejero	Texto	-
903	caminos, cañadas	Texto	-
904	carreteras y ffcc	Texto	-
905	casas, cortijos	Texto	-
906	comunidad autónoma	Texto	-
907	parajes	Texto	-
908	provincia	Texto	-
909	término municipal	Texto	-
910	textos informativos	Texto	-
911	textos catastro	Texto	-