

Enclosure 2

(Ref. Technical Letter F500-L14-033)



**Center for Advanced
Aviation System Development**

Photogrammetric, Satellite-Based Survey of the Texcoco Area and Its Surroundings

Site Assessment Report

MITRE is responsible for the procurement of a satellite-based survey of the Texcoco area and its surroundings. In the late April/early May timeframe, a team of survey experts from MDA Geospatial Services Inc. (MDA), the company performing the survey, visited Mexico City for a one-week period to perform a site assessment. The purpose of the site assessment was to gather data, specifically Ground Control Points (GCPs) to assist in the development of the survey. This enclosure describes that work.

Prepared for

Aeropuertos y Servicios Auxiliares

June 2014

*Photogrammetric, Satellite-Based Survey of the
Texcoco Area and Its Surroundings:
Site Assessment Report*

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Acronyms

3D	Three (3) Dimensional
AGL	Above Ground Level
ARP	Antenna Reference Point
ASA	Aeropuertos y Servicios Auxiliares
CORS	Continuously Operating Reference Stations
GCPs	Ground Control Points
GIS	Geographic Information System
GPS	Global Positioning System
EGM96	Earth Gravitational Model 1996
INEGI	Instituto Nacional de Estadística y Geografía / National Institute of Statistics and Geography
km	kilometre
m	metre
mm	millimetre
MDA	MacDONALD, DETTWILER AND ASSOCIATES LTD.
MITRE	The MITRE Corporation
AICM	Mexico City International Airport
MSL	Mean Sea Level
PSA	Photogrammetric Survey Area
SCT	Secretaría de Comunicaciones y Transportes
SEMARNAT	Secretaría de Medio Ambiente y Recurso Naturales
SRTM	Shuttle RADAR Topography Mission
sq km	Square Kilometres
WGS84	World Geodetic System 1984
ZMVM	Zona Metropolitana del Valle de México

1 INTRODUCTION

The Site Assessment Report provides an initial understanding of the project areas and collection of Ground Control Points to ensure the accuracy of the resulting satellite analysis.

The project titled the Photogrammetric, Satellite-Based Survey of the Texcoco Area and Its Surroundings (hereafter referred to as the “Project”) began on 17 March 2014. The survey will be used to support The MITRE Corporation (hereafter referred to as “MITRE”) in conducting aeronautical analyses in support of Aeropuertos y Servicios Auxiliares (hereafter referred to as “ASA”). The first component of the Project was to perform a Site Assessment. The purpose of the Site Assessment was to gather data, specifically Ground Control Points (GCPs) to assist in the development of the survey. These points, coupled with field checks, will improve detection of features in the satellite imagery and facilitate planning of the ground surveys to follow.

The Project started with a Kick-Off meeting held on Monday, 28 April 2014 at the ASA offices in Mexico City. The objective of the meeting was to introduce ASA to MDA Geospatial Services Inc. (hereafter referred to as “MDA”), and for MDA to provide a presentation on the preparation of the Three Dimensional (3D) survey using high-resolution imagery. The meeting was attended by Mr. Kevin O’Neill, Director of Business Development of MDA, Ms. Suzanne Brunke, Project Manager of MDA, Mr. Gyan Verma, QA Manager of MDA, Ing. Jorge Nevárez Jacobo, Coordinator of Subcontractors, and Ing. David de Jesús Zuñiga, Assistant to Jorge Nevárez.

The Site Assessment took place in Mexico City from 29 April through 2 May 2014. Ms. Brunke and Mr. Verma participated for the full four days of the Site Assessment. Ing. Nevárez facilitated and coordinated the visit and assigned Ing. de Jesús as the translator and main point of contact for MDA during the Site Assessment, and Sr. Victor Espinoza as the driver. Both Ing. Nevárez and Ing. de Jesús ensured that MDA had everything that they required to successfully fulfil the Site Assessment segment of the Project.

2 COORDINATION AND PLANNING

Coordination and planning are critical to the objective of this Project.

2.1 Planning

On 4 April 2014, Ms. Brunke provided MITRE and ASA with a map of prospective GCP locations. These locations could be modified in the field, but the main criterion was that the GCPs be well distributed throughout the Project area and that they be recognizable in the satellite imagery. Ing. Nevárez assigned Ing. de Jesús and Sr. Espinoza to prepare a driving plan to determine the best way to navigate to the GCPs.

Ms. Brunke requested that ASA prepare an official letter on company letterhead, in Spanish, to state the purpose of the survey and description of the equipment that was being brought into Mexico for the Site Assessment. A similar letter was also prepared for Mr. Verma. These letters were very helpful during discussions with Customs Authority officials when the team was bringing the equipment into Mexico to carry out the Site Assessment.

ASA arranged for the use of a fifteen-passenger Toyota van and a professional driver, Sr. Espinoza, for the Site Assessment. Ing. de Jesús also accompanied the team and provided coordination, translation and logistics support.

2.2 Survey Equipment

In preparation of the Site Assessment, MDA brought the following survey equipment from Canada to Mexico (Table 1).

Table 1 - MDA Equipment used during the Site Assessment

Quantity	Equipment
2	Trimble GeoXT Explorer 6000 Global Positioning System (GPS)
2	Trimble Hurricane Antenna
2	Mounting Pole for GPS and Antenna
1	Canon SX280 GPS digital camera
1	TomTom Car GPS
1	Dell E6430 Laptop

The Trimble GeoXT Explorer 6000 is a high performance GPS receiver with an on-board computer loaded with ArcGIS Mobile Geographic Information System (GIS) support software (Figure 1). An external antenna, resistant to signal interference and multipath was used to obtain a higher yield of GPS satellite positions and to improve performance and accuracy. The antenna was connected to the GPS on top of a mounting pole to improve satellite visibility. The GPS collects GCPs in X, Y, Z, latitude, longitude and height above Ellipsoid (HAE).



Figure 1 – A Trimble GeoXT Explorer 6000 GPS Was Used to Collect GCPs during the Site Assessment

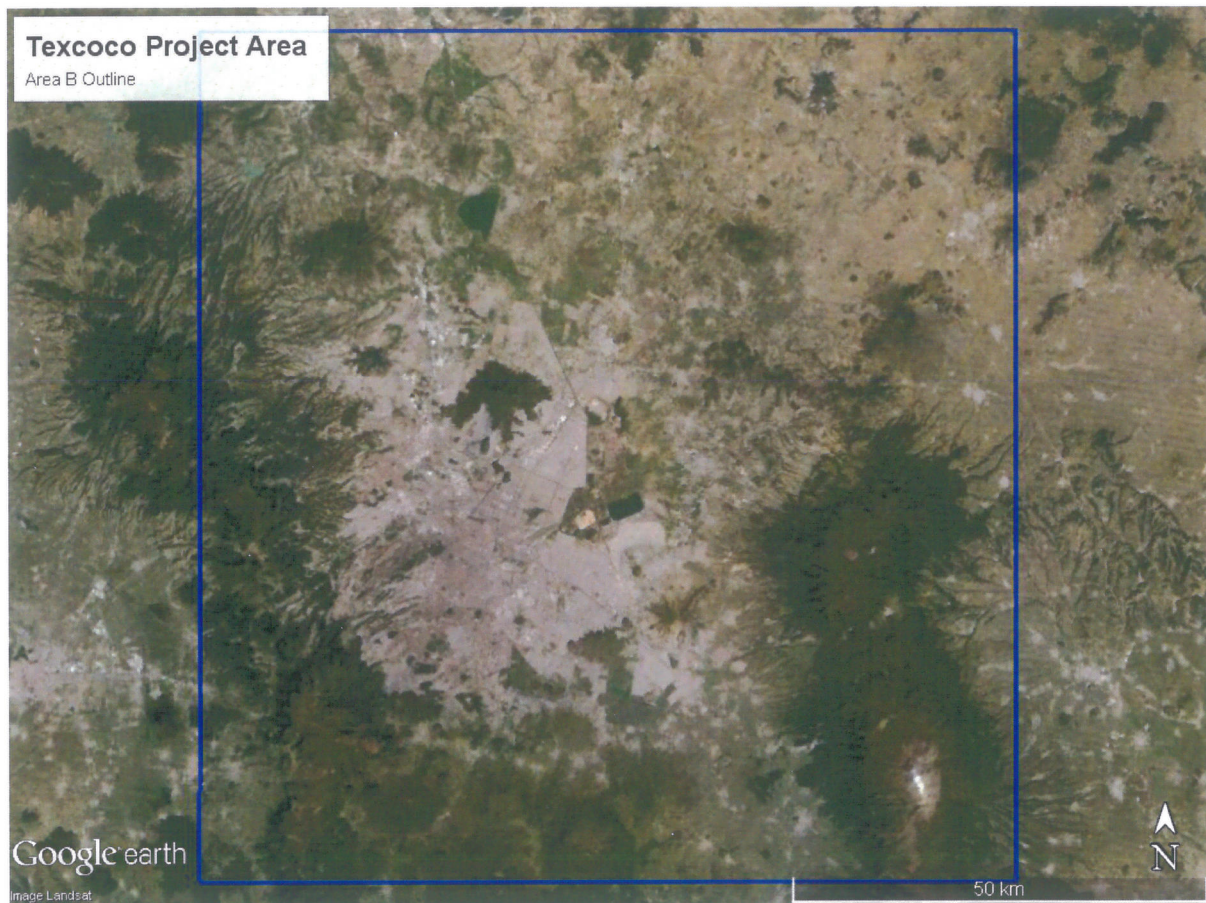
Also included in the shipment was a Canon SX280 GPS equipped digital camera for taking detailed and overview photographs of the GCP locations, a TomTom Car GPS outfitted with Mexico street maps for navigating throughout the survey area, and a DELL E6430 Laptop for recording and processing data points.

3 LOCATION OVERVIEW

Knowledge of the environmental conditions provides valuable information to support a thorough survey.

3.1 Location

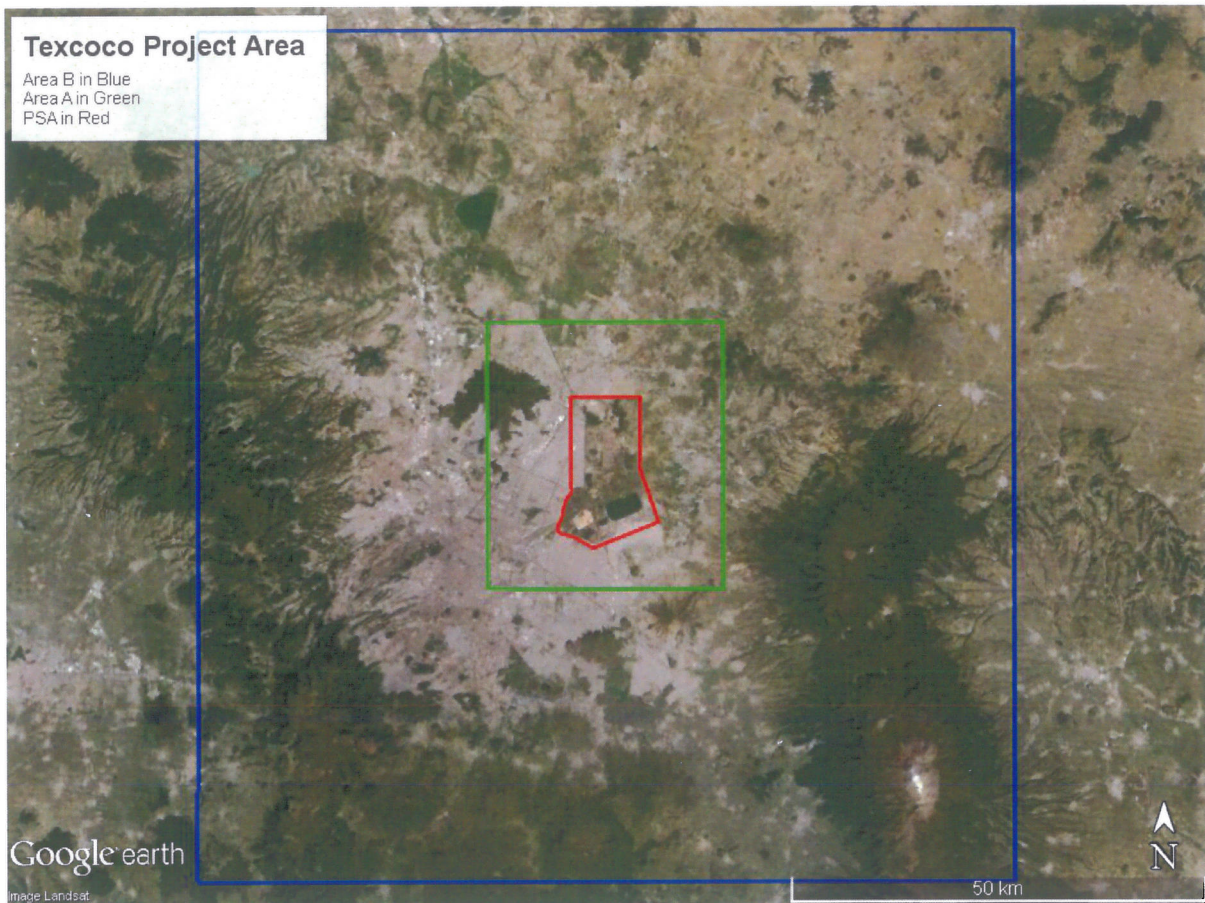
The Project area is located in central Mexico and encompasses parts of five states: Hidalgo, Mexico, Morelos, Puebla, and Tlaxcala (Figure 2). The Project area also includes Mexico City, which is the largest city in Mexico. According to the 2010 census compiled by the Mexican Institute of Statistics and Geography - Instituto Nacional de Estadística y Geografía (INEGI) there are 8,720,916 people in the Federal District of Mexico City (*Distrito Federal*) and over 20 million people in the Zona Metropolitana del Valle de México (ZMVM).



Source: GoogleEarth

Figure 2 – Extent of Project Survey Area

The survey site is composed of three areas: the Photogrammetric Survey Area (PSA), Area A, and Area B (Figure 3).



Source: GoogleEarth

Figure 3 - The Project Survey Site is Composed of Three Areas: PSA (Red), Area A (Green), and Area B (Blue)

3.1.1 PSA

The PSA is located to the east and northeast of one of the most densely populated urban areas of Mexico City. The PSA requires a complete survey of all features, terrain, and objects. The PSA is 157 Square Kilometres (sq km) in area. In the north of the PSA is the salt processing plant known as “El Caracol”. To the south is the artificial lake of Lago Nabor Carrillo (Figure 4).

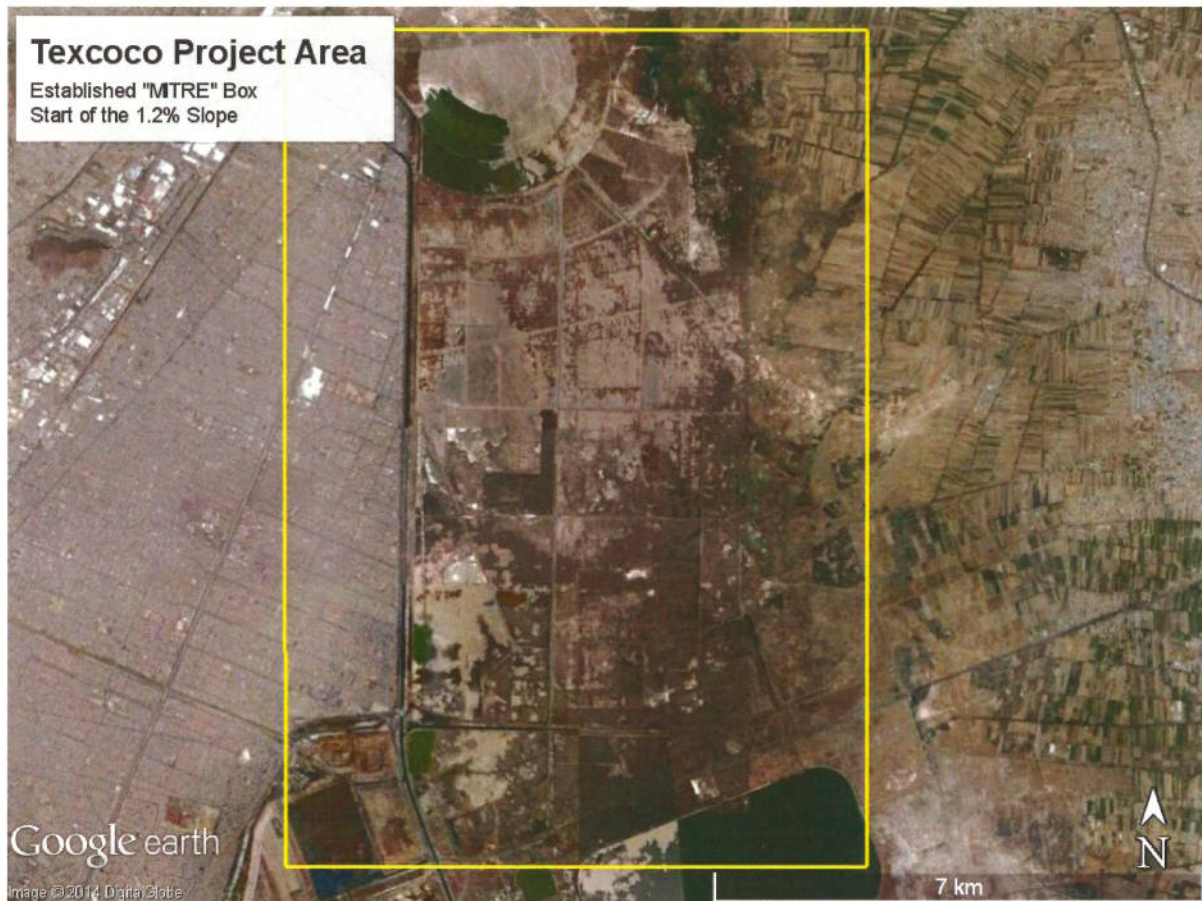


Source: GoogleEarth

Figure 4 – Overview of the PSA

3.1.2 Area A

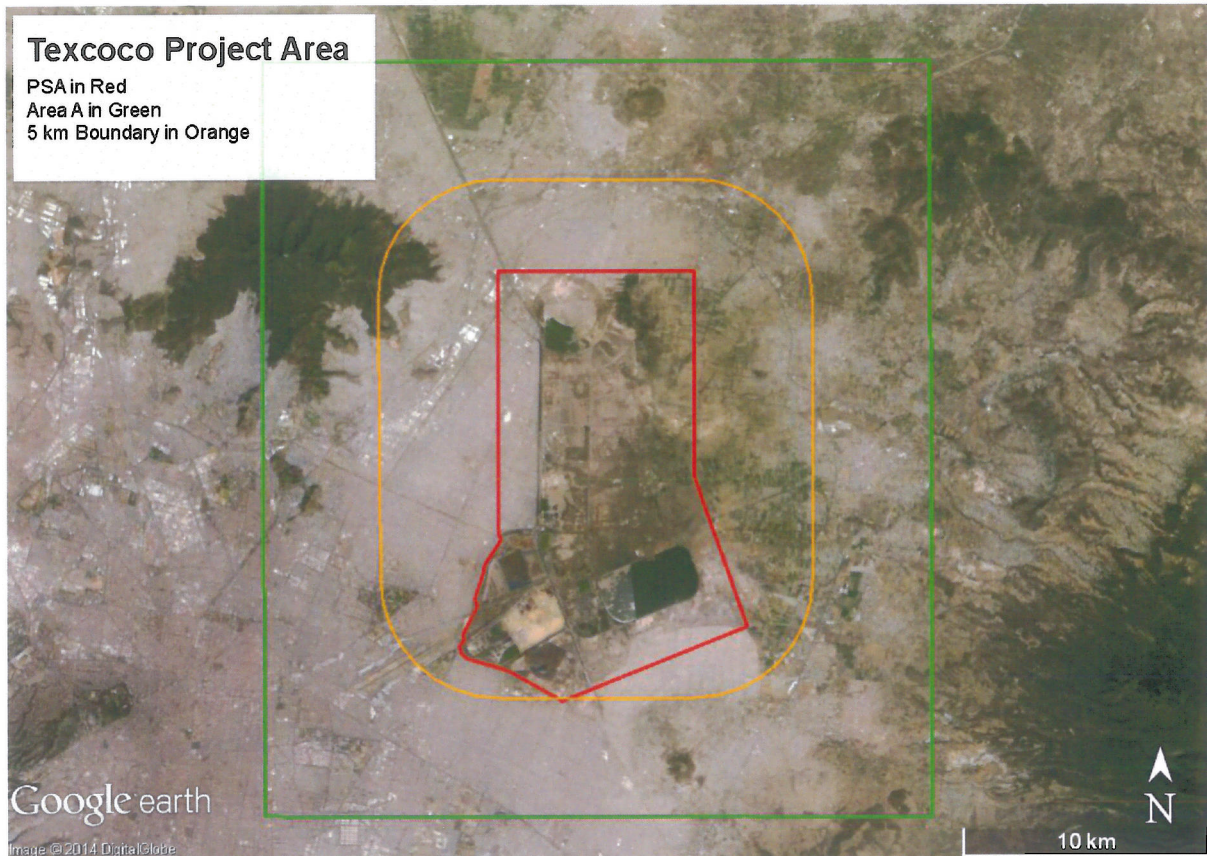
Area A is the area located directly outside of the PSA. Area A requires a survey of all terrain. Additionally, all obstructions (including terrain) penetrating either a sloping surface (Section 1) or a minimum elevation (Section 2) will be surveyed. Area A Section 1 is offset from the MITRE Box 5 km in all directions with rounded corners (the MITRE box is shown in Figure 5), and at its extents represents a 1.2% slope at 60 m above the lowest surveyed MSL elevation of the PSA.



Source: GoogleEarth

Figure 5 – Pre-established MITRE Box Boundary (Shown in Yellow)

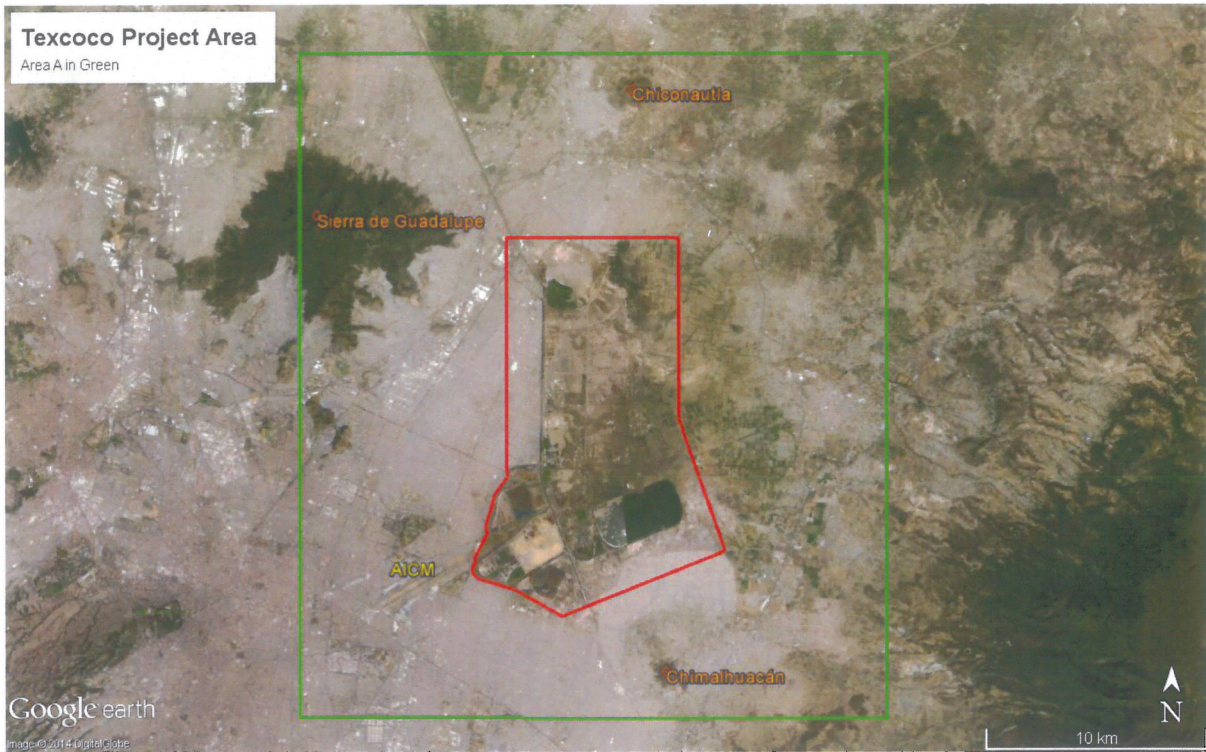
Area A Section 2 begins at the outer boundary of Area A Section 1 and extends 10 km (as measured from the MITRE Box) in all directions until reaching the inner boundary of Area B (shown in Figure 6). Area A Section 2 is a flat surface 60 m above the lowest surveyed MSL elevation of the PSA. Area A is 750 sq km in area, excluding the PSA, and 907 sq km including the PSA.



Source: GoogleEarth

Figure 6 – Overview of Area A and 5 km Boundary

Area A includes the populous areas of northeastern Mexico City. The areas of Sierra de Guadalupe, Chiconautla, and Chimalhuacán (referred to in this document as the “Sub-Areas” are also located in Area A. Mexico City International Airport (AICM) is located in the southwest portion of Area A. Figure 7 shows the location of these Sub-Areas.



Source: GoogleEarth

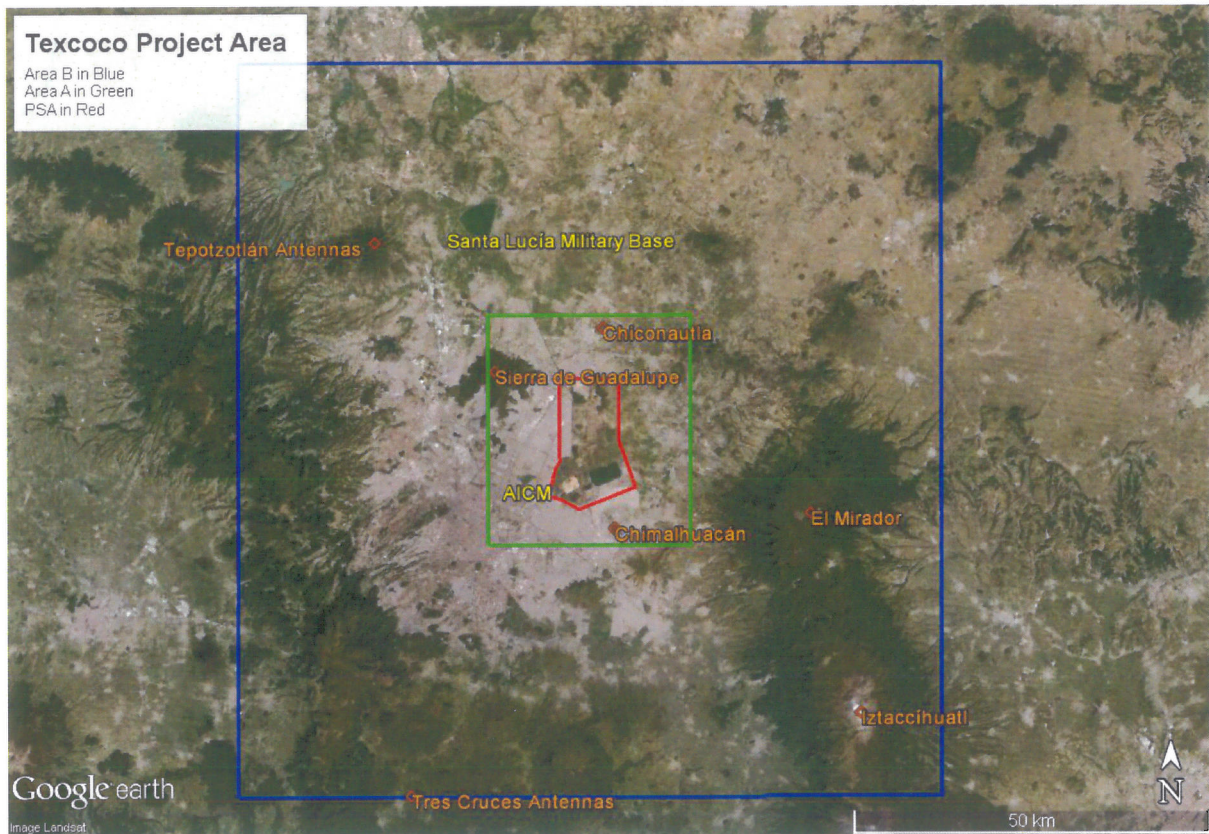
Figure 7 – Overview of Area A and Three Sub-Areas

3.1.3 Area B

Area B is an area outside of Area A extending 35 km in all directions. Area B requires the survey of obstructions that are ≥ 60 m Above Ground Level (AGL). Area B is 9,150 sq km in area, excluding the PSA and Area A. Mexico City is located in the central part of Area B. Mountains are located to the southwest and southeast of the city. Two famous mountain peaks located in the southeastern portion of Area B are “El Mirador” and “Iztaccíhuatl”. Prominent antennas are located at Tepotzotlán, Tres Cruces and Sierra de Guadalupe (Figure 8). The Santa Lucía Military Base is also located in Area B. Figure 9 provides an overview of Area B.



Figure 8 - Prominent Antennas Located on top of Sierra de Guadalupe

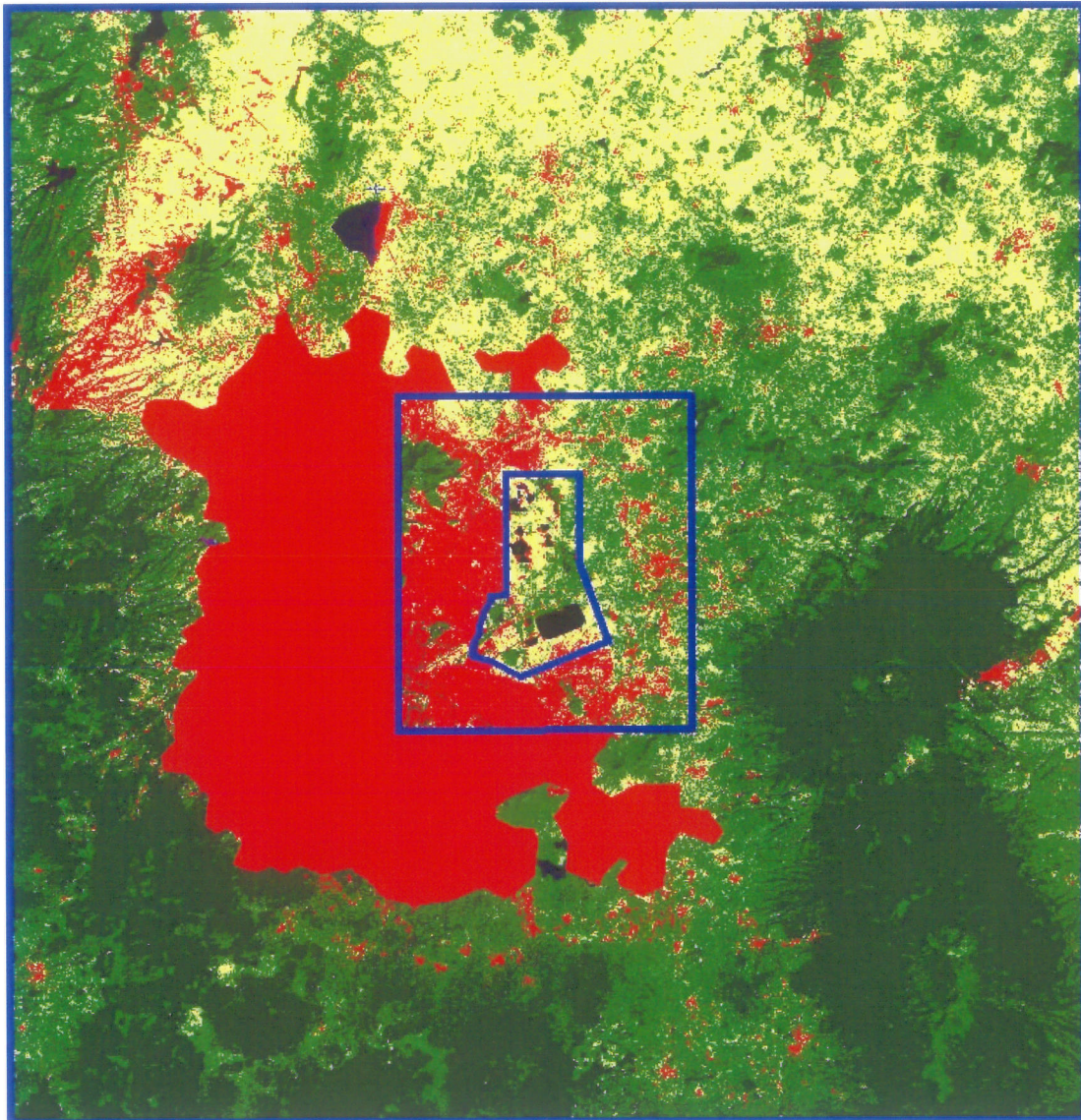


Source: GoogleEarth

Figure 9 – Overview of Area B

3.2 Land Use

Knowledge of the Project area land use is invaluable to the planning and verification of the survey. There are three main land uses in the Project area: urban, forest, and agricultural (Figure 10).



Source: MDA, All Rights Reserved 2014

Figure 10 – Land Use Classification of Texcoco Area: Urban (Red), Agricultural (Yellow), and Forest / Greenspace (Green)

3.3 Climate

Climate is critical to this Project as optical satellites require cloud-free weather to image the earth's features and terrain. Based on average annual rainfall information provided by the Comisión Nacional del Agua of the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), June to September are the rainy months in the Texcoco area and are less suitable for obtaining reduced cloud cover imagery (Table 2).

Table 2 - Average Annual Rainfall in Millimeters for the Mexican States Which Fall Into the Survey Area

State	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Distrito Federal	7.8	4.7	8.9	23	50.7	124	155	142	123	50.4	10.5	6.1
Hidalgo	21.6	18.1	22	42	69.4	128	121	112	161	80.5	37.3	22.5
Mexico	14.2	6.8	9.4	25	65.1	164	193	183	167	75.4	21.1	9.4
Morelos	10.4	3.3	4.3	14	53.6	183	174	157	183	66.2	13.7	4.4
Puebla	30.6	25.5	26	44	83.3	181	188	174	222	123	59.9	35.4
Tlaxcala	7.9	6.6	11	33	73.1	130	126	124	107	51.4	16.4	6.9

Source: SEMARNAT

As seen in Table 2, the average rainfall in the Project area starts to increase in April as the full rainy season begins in June. The Project was fortunate in that satellite acquisition took approximately 6 weeks, from 12 March through 28 April, and only two swaths required more than one attempt to achieve the cloud parameters. Please refer to the Satellite Acquisition Completion Report for more details on each satellite image and the dates that they were acquired.

The following are weather observations made by MDA in their field notes during the Site Assessment:

- Monday, 28 April – sunny with a few clouds; warm temperatures; no rain
- Tuesday, 29 April – sunny with partial clouds; warm temperatures; no rain
- Wednesday, 30 April – sunny with partial clouds; warm temperatures; rain with thunder and lightning in the afternoon
- Thursday, 1 May – sunny with partial clouds during the morning; warm temperatures; scattered rain showers in the afternoon and evening
- Friday, 2 May – sunny with partial clouds during the morning; warm temperatures; a few rain showers in the afternoon

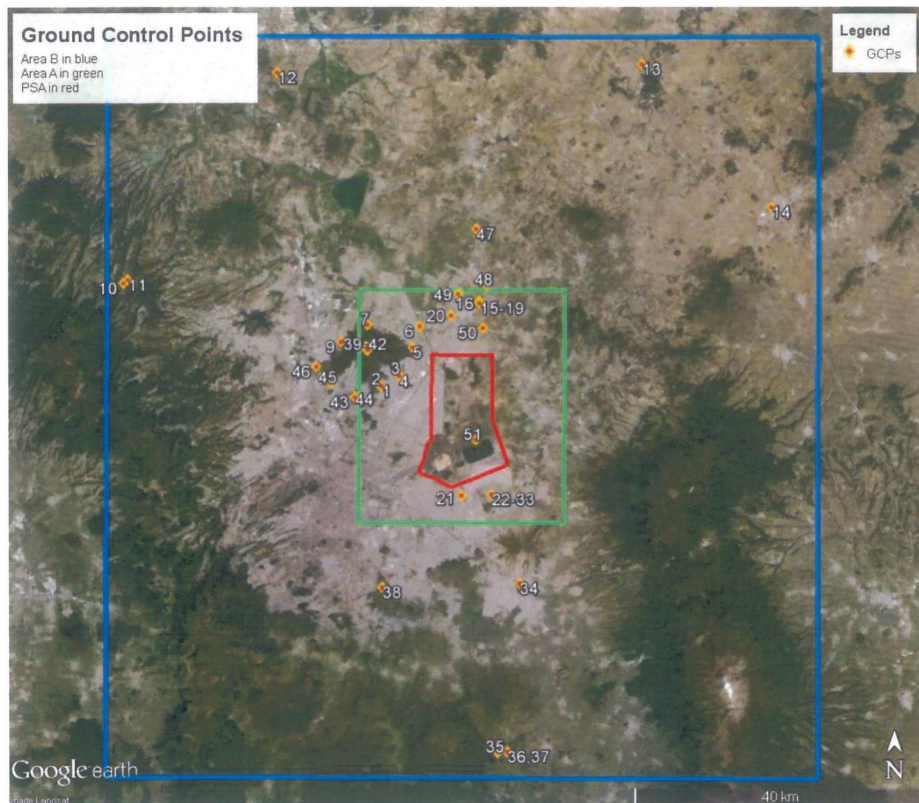
4 DATA INVENTORY

A well-organized data inventory is essential to the success of the survey.

Building a data inventory is a key component and contributor to the success of the survey. It provides vital information relevant to the measure of terrain and obstructions and assists with evaluation, planning, execution, and quality assurance of the survey. Data to be integrated into the Project inventory are: geospatial data in the public domain; MDA collected GCPs; and newly acquired satellite imagery and information that MDA will derive from the satellite imagery.

4.1 GCPs

Fifty-one (51) new GCPs were collected during the Site Assessment. GCPs were obtained in the extents of Areas A and B for the geocorrection of the monoscopic satellite imagery. A concentration of GCPs were collected on and around the three Sub-Areas for the geocorrection and triangulation of the stereo satellite imagery. The GCPs are well distributed over the entire survey area and in locations that can be clearly recognized in the satellite imagery (Figure 11).



Source: GoogleEarth

Figure 11 - Location of GCPs Collected During the Site Assessment

The GCP locations were measured using a high-precision GPS with an antenna, as described in Section 2.2. Photographs were taken of each location for reference (Figure 12).



Figure 12 - Reference Photographs Were Taken of GCP Locations

The GCPs were differentially post-processed at the MDA office in Vancouver using Continuously Operating Reference Stations (CORS) to calculate the difference between the positions transmitted by the satellite systems and the known fixed locations. The CORS system enables positioning accuracies that approach a few centimetres relative to the National Spatial Reference System, both horizontally and vertically. The faster the sampling rate, the more accurate the reference station. For example, the 1 second stations are the most accurate survey grade, decreasing in accuracy to the 30 second stations.

The closest base station to the Project area was located in Mexico City; however this site was not transmitting an adequate signal during the Site Assessment trip so the site in Toluca was used, which had a much higher accuracy. The Toluca CORS site location, which transmits at a 1 second interval, is provided below in Table 3 and Figure 13. The Toluca station was operational during the field assessment visit, as shown in the data availability profile in Figure 14 for Julian days 157 through 163, except for a couple of minute failures on day 158 and 160.

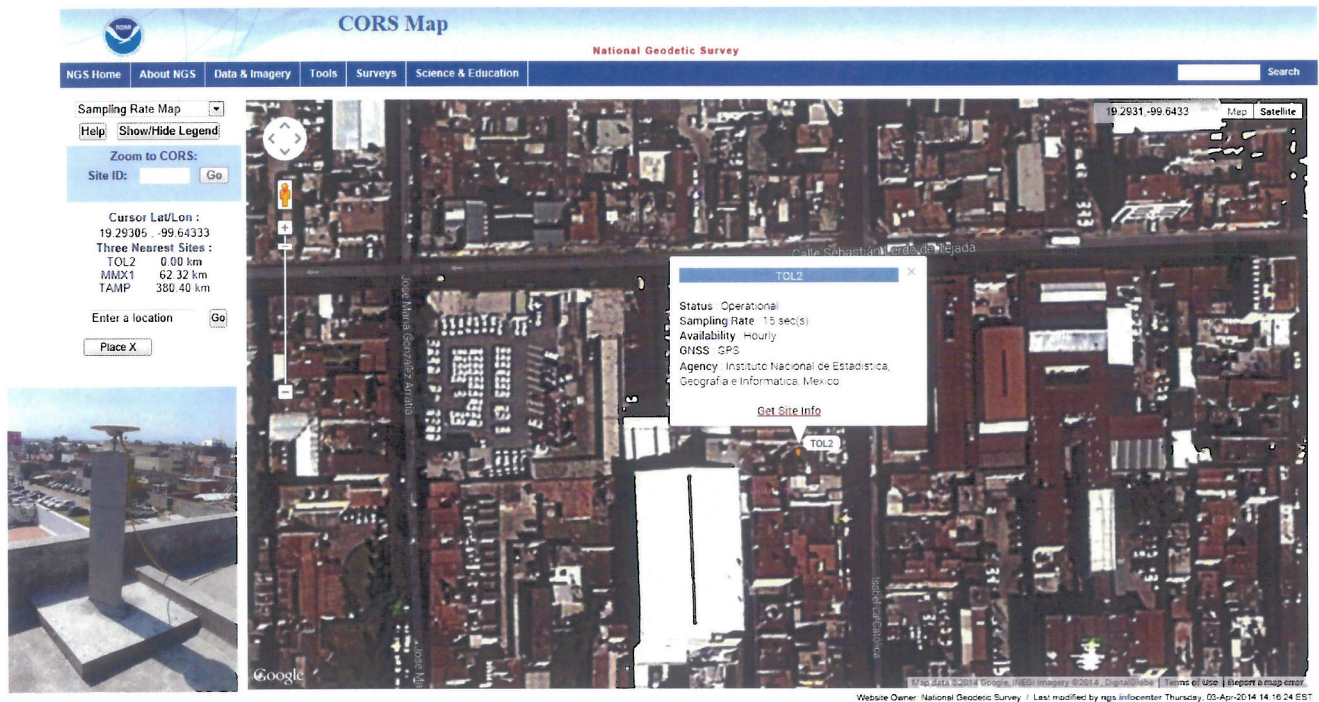
Table 3 - Antenna Reference Point Data Used to Process GCPs

Antenna Reference Point(ARP): TOLUCA CORS ARP

PID = DH8722

Latitude and Longitude = 19° 17 35.64360 N, 99° 38 36.49913 W

The PID is the Permanent Identifier which is assigned to each CORS station as a unique code.



Source: GoogleEarth and NOAA

Figure 13 - Location of CORS Site Used to Post Process GCPs

Data Availability Profile for:

TOL2

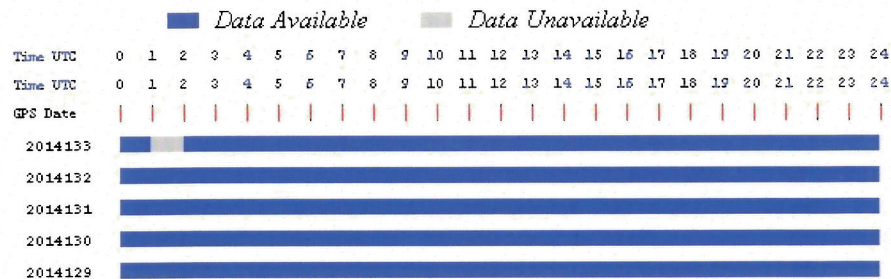


Figure 14 - Data Availability Profile for 1 Second Toluca Base Station

Post-processing improved the accuracies of the GCPs collected, and the increased distance to the Toluca base station did not decrease the final accuracies. In fact, using the Toluca Base station increased overall GCP accuracy as can be seen in Table 4.

Table 4 – Accuracy Results for Post-Processed GCPs

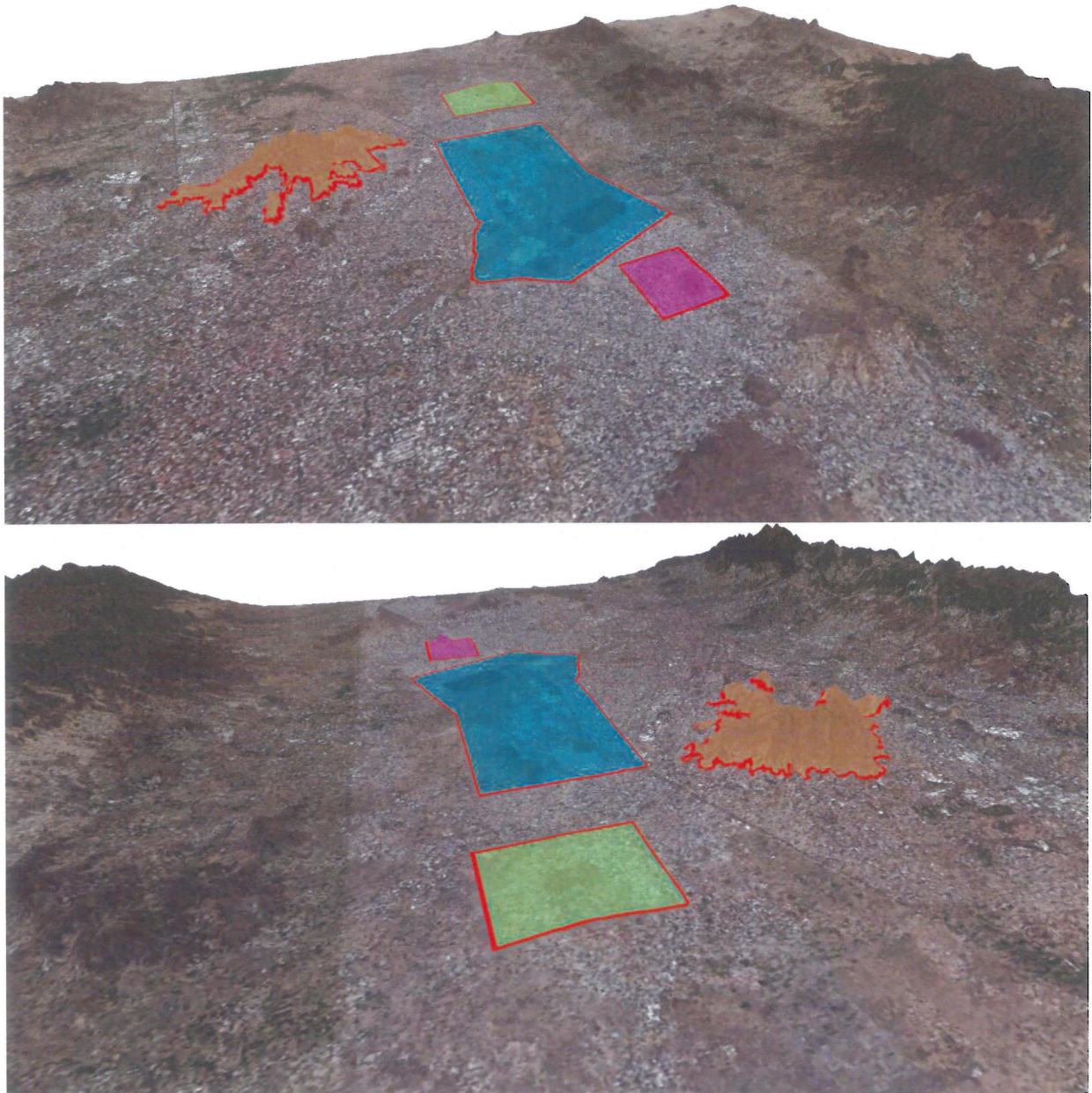
Toluca "TOL2" Base Station Accuracies	Mexico City "MMX1" Base Station Accuracies
A total of 1011 (99.8%) of 1013 positions were differentially corrected.	A total of 987 (97.4%) of 1013 positions were differentially corrected.
Estimated accuracies (68%) for 1013 positions are as follows:	Estimated accuracies (68%) for 987 positions are as follows:
0 - 15cm -	0 - 15cm -
15 - 30cm -	15 - 30cm -
30 - 50cm 97.8%	30 - 50cm 53.7%
0.5 - 1m 1.7%	0.5 - 1m 32.1%
1 - 2m 0.2%	1 - 2m 13.6%
2 - 5m 0.1%	2 - 5m 0.6%
> 5m 0.2%	> 5m -

4.2 Geospatial Data in the Public Domain

Publicly available data was helpful for planning field checks and for identifying areas that may require further investigation. Sources for data in the public domain may not be reliable and therefore will need to be verified in the satellite imagery upon acquisition.

4.2.1 Shuttle RADAR Topography Mission Data

The Shuttle RADAR Topography Mission (SRTM) acquired elevation data of the earth's topography and is available from the National Aeronautics and Space Administration (NASA). The SRTM data over Area B (including the PSA and Area A) was obtained and will be utilized in the survey to orthorectify the WorldView-2 colour monoscopic imagery and to generate 5 m contours for Area B (Figure 15).



Note: a two-time exaggeration of elevation was applied for emphasis.

Source: Imagery© DigitalGlobe, 2014. Vectors MDA, All Rights Reserved 2014

Figure 15 - SRTM Data Obtained for Area B (Including the PSA and Area A)

4.2.2 MDA Collected Ground Data

MDA collected ground data includes the field checks made during the Site Assessment. Additional field checks will be undertaken in the ground surveys to follow.

4.2.3 Field Checks

At each GCP, a GPS reading was acquired for latitude, longitude, and elevation. At every location, multiple reference photographs attributed with the camera's GPS coordinates were taken including: (1) a detail photograph of the ground position of the GPS instrument, and (2) several perspective and overview photographs of the GPS location from each direction. Notes were taken on the location and surrounding features, along with a sketch map. The GPS data was exported into Excel format to be incorporated into the survey database. See Appendix A for details on the GCPs.

4.2.4 Ground Survey

Two additional ground surveys are planned for the Project: Field Ground Truthing and Field Validation. The Field Ground Truthing survey is to obtain AGL height information of features that are mapped utilizing the monoscopic satellite imagery. The Field Validation survey is to verify and validate findings from the stereoscopic satellite imagery and re-visit any areas required.

The ground survey process is similar to the Site Assessment, except that the measurement equipment also includes a laser range finder to obtain height information for obstructions found in the field. The GPS data is exported into Excel format to be incorporated into the survey database and ESRI shapefile format to be ingested into a GIS database. The ground survey also includes photographic data and field notes to assist in the identification and validation of features in the acquired imagery.

5 GCP COLLECTION

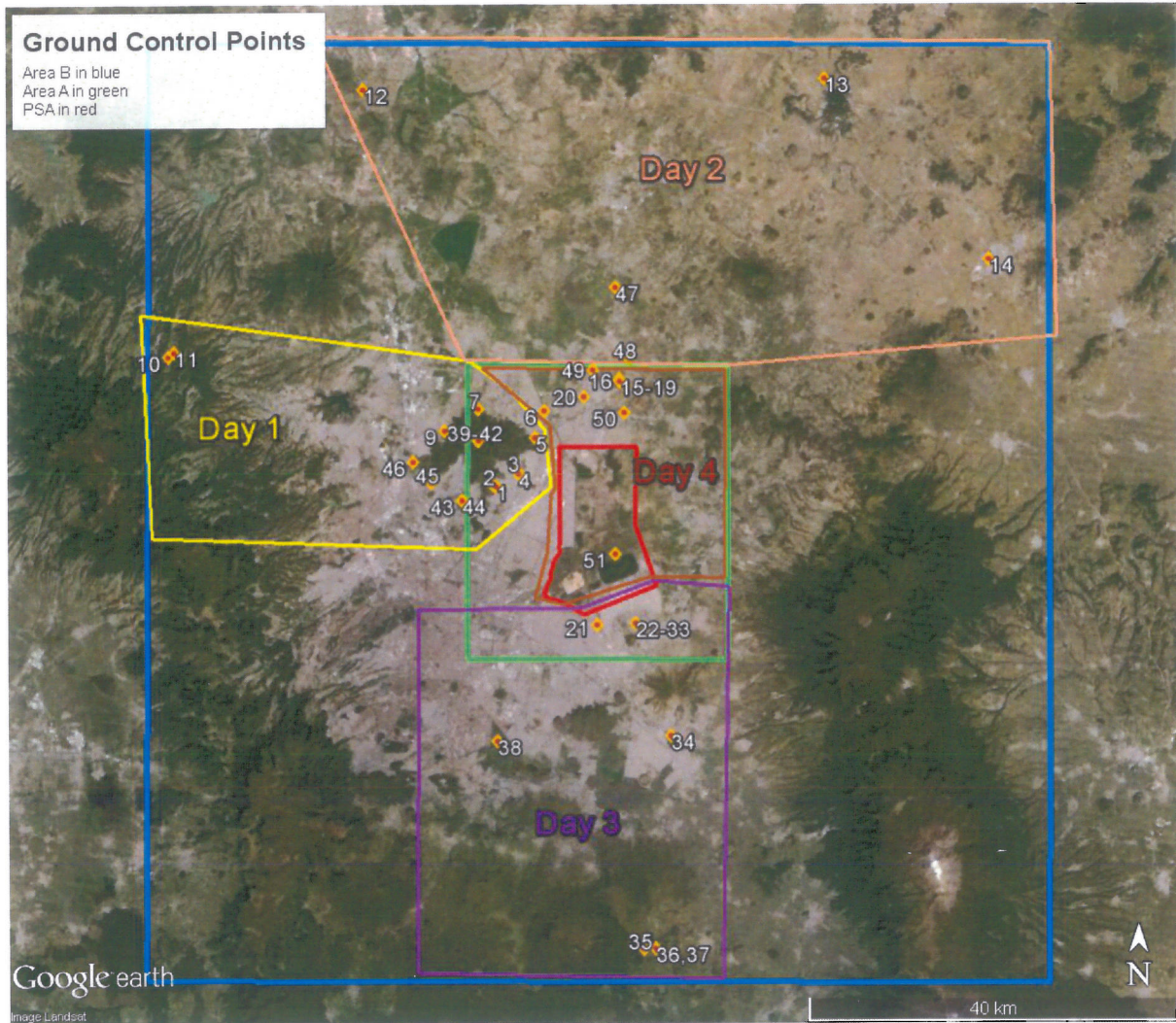
GCPs provide the necessary orientation of data to support a comprehensive survey.

GCP collection was performed for four days from 29 April to 2 May 2014. The collection was conducted by Ms. Brunke and Mr. Verma. ASA provided a vehicle and driver, as well as a liaison / translator. The objective of the Site Assessment was to observe as much of the overall terrain and features as possible during the four days, and to collect GCPs in the extents of Area B for the geocorrection of the monoscopic satellite imagery, and to collect a concentration of GCPs in Area A around Sierra de Guadalupe, Chiconautla, and Chimalhuacán for the triangulation of the stereoscopic satellite imagery (Table 5).

Table 5 – GCP Collection Plan for the Site Assessment

Date	Field Check Area
Day 1: Tuesday, 29 April	Sierra de Guadalupe base and far west of Area B
Day 2: Wednesday, 30 April	Hidalgo and Chiconautla
Day 3: Thursday, 1 May	Chimalhuacán and far south of Area B
Day 4: Friday, 2 May	PSA. (The summit of Sierra de Guadalupe and Chiquihuite and the base of Chiconautla were visited this day as well.)

The plan for the four days was discussed and determined in coordination with ASA. The plan is laid out in Figure 16. Additional information on work performed during the four days of the Site Assessment is provided farther below.



Source: GoogleEarth

Figure 16 – GCP Collection Plan for the Four Days of the Site Assessment

5.1 Tuesday, 29 April

On Tuesday, 29 April Ms. Brunke and Mr. Verma met Ing. de Jesús in the lobby of the Airport Hilton Hotel. Ing. de Jesús introduced Sr. Espinoza, who would drive the MDA personnel in the ASA supplied van during the Site Assessment. Ms. Brunke and Ing. de Jesús then went over the Field Check Plan for the four days of the Site Assessment. The approach was to collect GCPs in each of the survey areas and to make observations that would aid in the development of the survey.

The team collected GCPs surrounding the base of Sierra de Guadalupe plus one to the far west of Area B. The team went to the top of public roads around Sierra de Guadalupe where the terrain was often steep as seen in Figure 17. Eleven GCPs were collected on 29 April (refer to the Appendix for details).



Figure 17 - Collecting GCP #2

5.2 Wednesday, 30 April

On Wednesday, 30 April the team headed north into the State of Hidalgo to collect GCPs in Area B. These three points (numbers 12, 13, and 14) were located a considerable distance away. Figure 18 shows the location of GCP #13. After the three furthest points were collected the team drove straight to the office of the Land Commissioner of Chiconuatla. A representative of the office of the Land Commission of Chiconuatla agreed to be our guide and accompany us on the climb to the top of Chiconautla where additional GCPs and antenna height measurements were collected.

Three GCPs were collected on the summit itself and surrounding area, and all antennas were measured with the laser range finder. Figure 19 shows the team and the

representative from the office of the Land Commission of Chiconuatla on Chiconautla. Eight GCPs were collected on 30 April (refer to the Appendix for details).



Figure 18 – Collecting GCP #13 near Tlaquilpan, Hidalgo



Figure 19 – Visit to Chiconautla

5.3 Thursday, 1 May

As 1 May is a holiday in Mexico there were celebrations around many communities which made it difficult to navigate at times. The team covered the central and southern regions of Area A, as well as the summit of Chimalhuachi (i.e., the hill at the center of the Chimalhuacán community, and a religious site).

Despite the holiday, we meet with the municipal leader of Chimalhuacán who provided escorts for the survey team to climb Chimalhuachi. GCPs 24 through 33 were then collected. Figure 20 shows the collection of GCP #27. In total, eighteen GCPs were collected on 1 May (refer to the Appendix for details).



Figure 20 – Collecting GCP #27 Located at the base of the White Cross on Chimalhuachi

5.4 Friday, 2 May

On Friday, 2 May the team covered the summits of Sierra de Guadalupe (Figure 21) and Chiquihuite (Figure 22), as well as the remaining points around the base of Chiconautla. Thirteen GCPs were collected on 2 May (refer to the Appendix for details).



Figure 21 – Antennas near the Summit of Sierra de Guadalupe



Figure 22 – Antennas near the Summit of Chiquihuite

Throughout the filed checks, questions arose from on-lookers and/or security personnel. Due to the confidential nature of the Project, the questions were primarily addressed by Ing. de Jesús or other official personnel. The Team and the officials that assisted in collecting points in Chimalhuacán are shown in Figure 23.



Figure 23 – Team and the Accompanying Officials at GCP #26

6 CONCLUSION

The next steps towards completion of the survey.

MDA will utilize the Site Assessment data in conjunction with the newly acquired satellite imagery to prepare for the first ground survey planned for 9 – 20 June 2014.

6.1 WorldView-1 Panchromatic Stereo Imagery

WorldView-1 panchromatic stereo imagery was ordered to cover the PSA and Area A and parts of Area B. The imagery resolution is 0.46 m at nadir when acquired, but will be processed to a 0.50 m pan-sharpened pixel resolution for delivery. DigitalGlobe will provide the data with the following concessions:

- Preview images: allowance for MDA and MITRE to review images before final acceptance and cease of tasking.
- Cloud-free: 0-15% cloud cover with up to 10 – 4 X 4 sq km areas that must be cloud-free. The 10 – 4 X 4 sq km cloud-free areas are shown in Figure 24.



Source: GoogleEarth

Figure 24 – Requested Cloud-free Areas for WorldView-2 Imagery

6.2 WorldView-2 Colour Monoscopic Imagery

WorldView-2 natural colour monoscopic imagery was ordered to cover all of Area B, including the PSA and Area A and the three Sub-Areas. The data resolution is 0.46 m at nadir when acquired, but will be processed to a 0.50 m pan-sharpened pixel resolution for delivery. DigitalGlobe will provide the data with the following concessions:

- Preview images: A low resolution image sample will be provided for scenes that have clouds exceeding 15% cloud coverage for possible acceptance.
- Cloud-free: 0-15% with up to 10 – 4 X 4 sq km areas that must be cloud-free. The 10 – 4 X 4 sq km cloud-free areas are shown in Figure 24

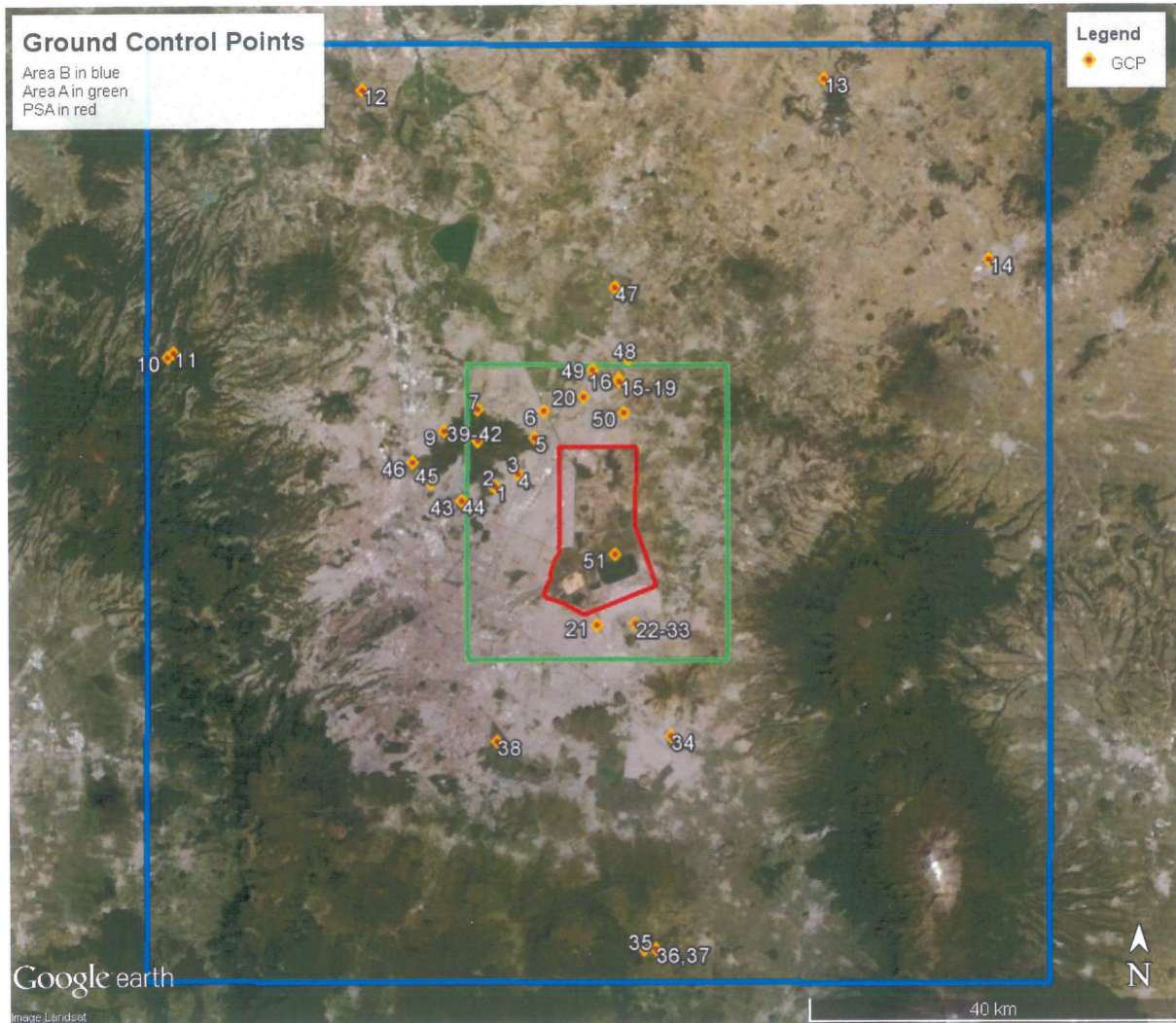
As mentioned in Section 4.2.4, the Field Ground Truthing survey will be conducted 9 - 20 June, 2014. After the Field Ground Truthing survey MDA will post-process and tabulate the data collected in the field for inclusion in the Field Ground Truthing Report and the final deliverables. The data from the stereoscopic data collection will be complete in early July, and MDA will be performing QA and populating the GIS database to prepare for the Field Validation survey, expected to take place in August.

APPENDIX A

Ground Control Points

29 April - 2 May 2014

The Appendix contains information on all fifty-one collected GCPs shown in Figure A-1 below. Each GCP collected is described on a whole page, with the coordinates, date collected and field photographs.



Source: GoogleEarth

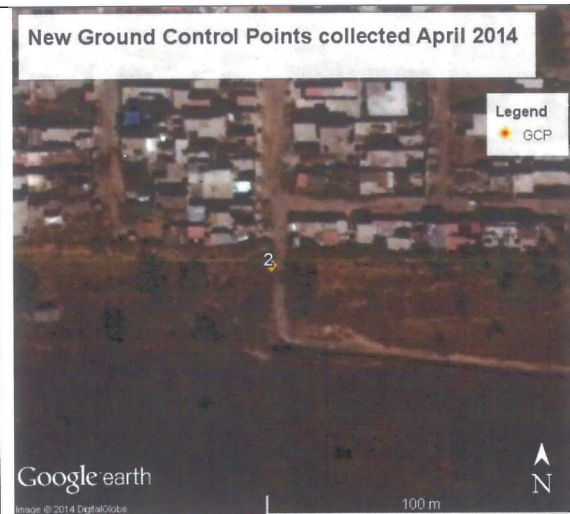
Figure A-1 – Summary Locations of 51 Ground Control Points Collected

Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP001	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 32' 47.75"N	Longitude: 99° 05' 45.56" W	Elevation 2479.6604m above Mean Sea Level (MSL)
Project Area: Sierra de Guadalupe		Datum: World Geodetic System 1984 (WGS84)/ Earth Gravitational Model 1996 (EGM96)

New Ground Control Points collected April 2014

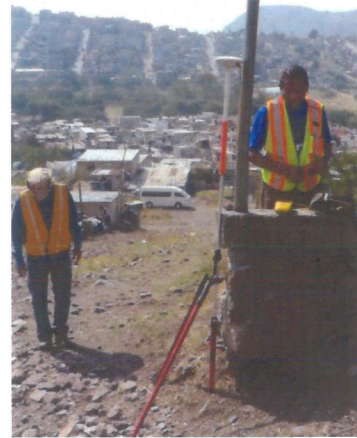


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP002	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 32' 54.14" N	Longitude: 99° 05' 57.32" W	Elevation 2409.9404m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96



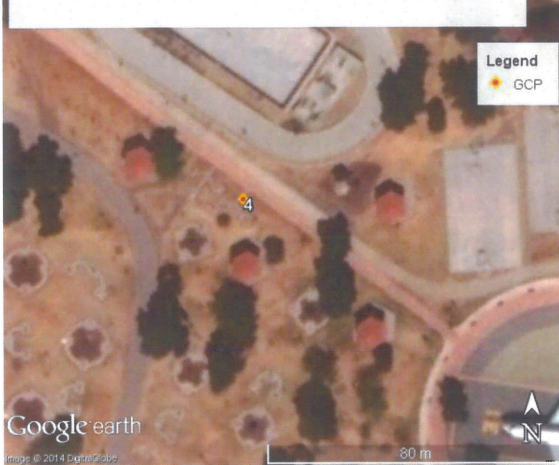
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP003	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 33' 42.04" N	Longitude: 99° 04' 24.68" W	Elevation 2326.6304m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected April 2014

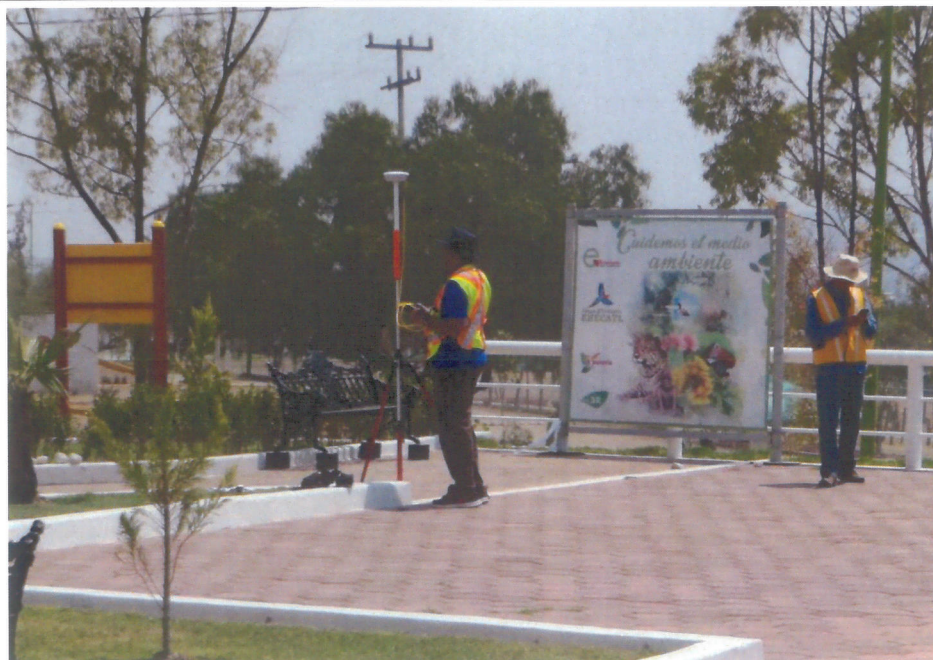
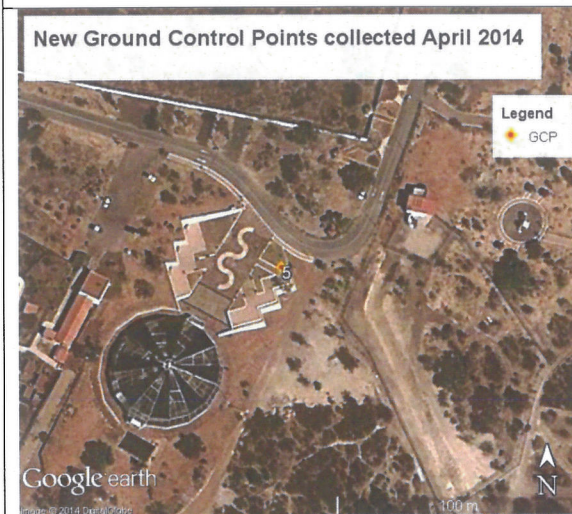


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP004	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 33' 32.09" N	Longitude: 099° 04' 20.57" W	Elevation 2285.9904m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected April 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP005	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 35' 40.20" N	Longitude: 099° 03' 19.78" W	Elevation 2306.3825m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP006	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 37' 15.35" N	Longitude: 099° 02' 45.48" W	Elevation 2237.04469m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

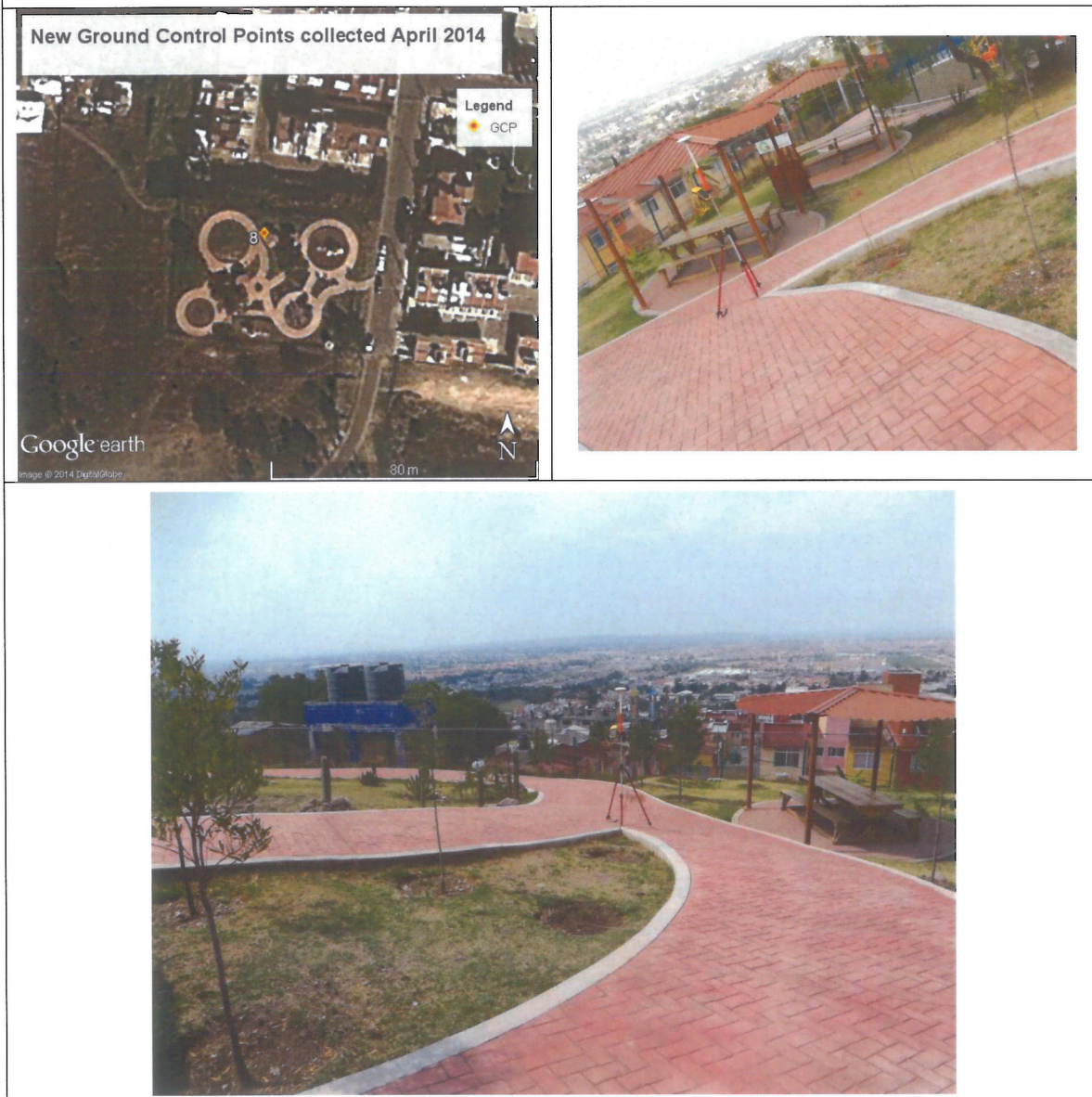
New Ground Control Points collected April 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP007	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 37' 21,06" N	Longitude: 099° 06' 51.90" W	Elevation 2352.1582m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP008	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 37' 21.30" N	Longitude: 099° 06' 52.80" W	Elevation 2352.5803m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

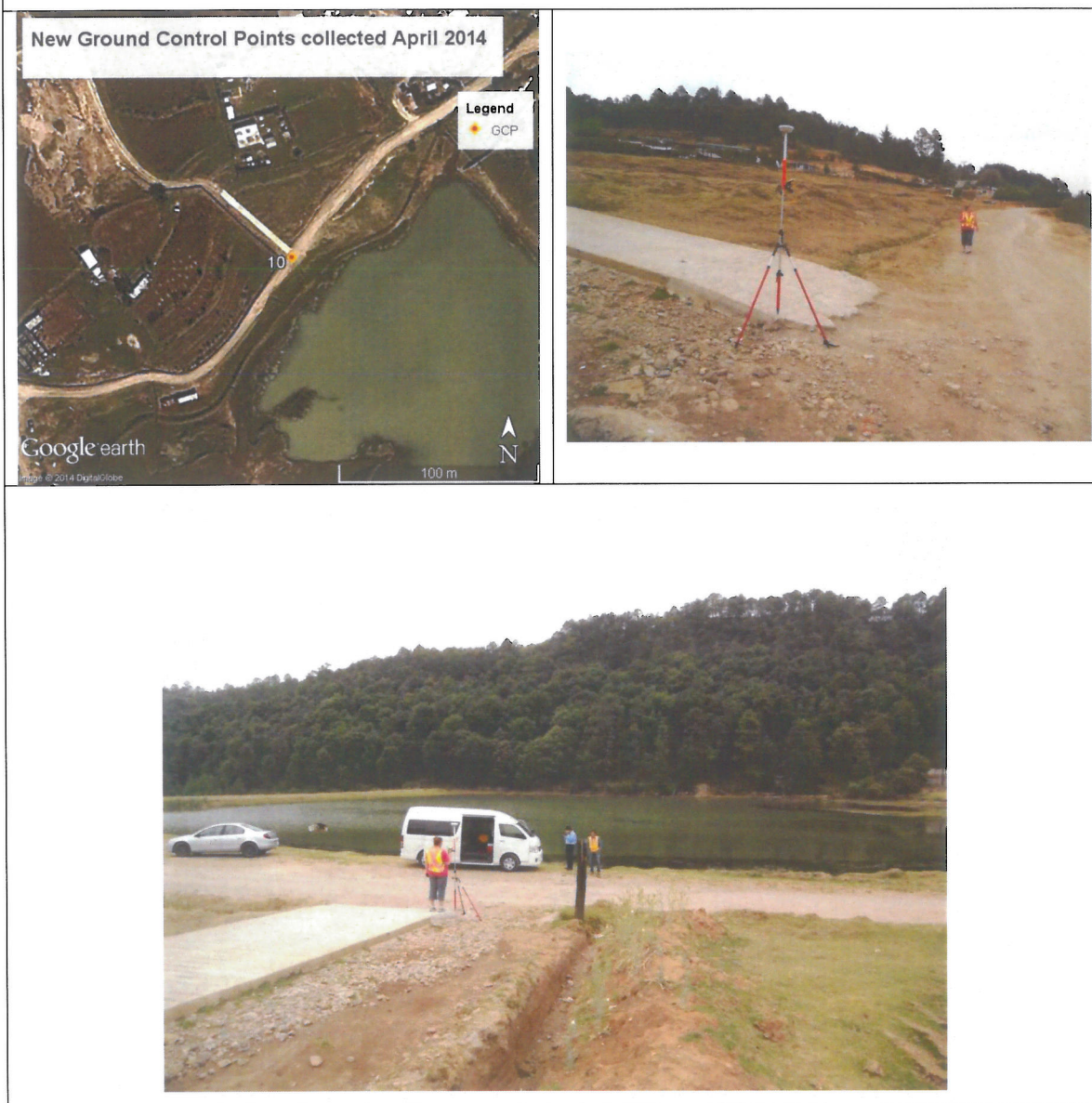


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP09	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 36' 3.70" N	Longitude: 99° 08' 56.20" W	Elevation 2324.4924m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected April 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP010	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 40' 23.32" N	Longitude: 99° 26' 13.12" W	Elevation 2560.3014m MSL
Project Area: Western edge of Area B		Datum: WGS84/EGM96

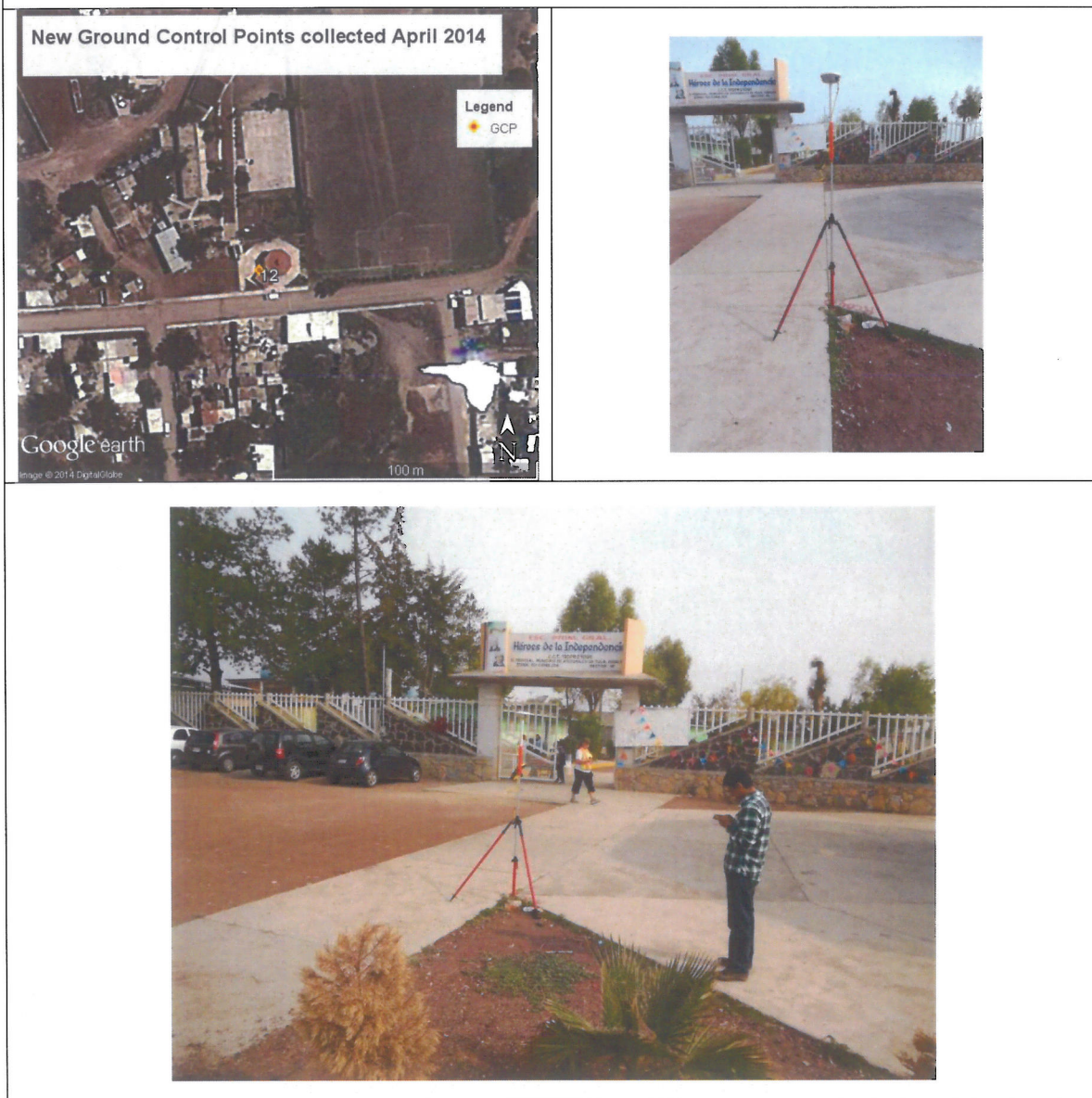


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP011	Collection Date: 29 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 40' 38.32" N	Longitude: 99° 25' 52.33" W	Elevation 2536.4097m MSL
Project Area: Western edge of Area B		Datum: WGS84/EGM96

New Ground Control Points collected April 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP012	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 56' 9.18" N	Longitude: 99° 14' 7.10" W	Elevation 2322.8854m MSL
Project Area: Hidalgo, southeast Area B		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP013	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 56' 50.64" N	Longitude: 98° 45' 15.08" W	Elevation 2442.6936m MSL
Project Area: Northeast of Area B		Datum: WGS84/EGM96

New Ground Control Points collected April 2014

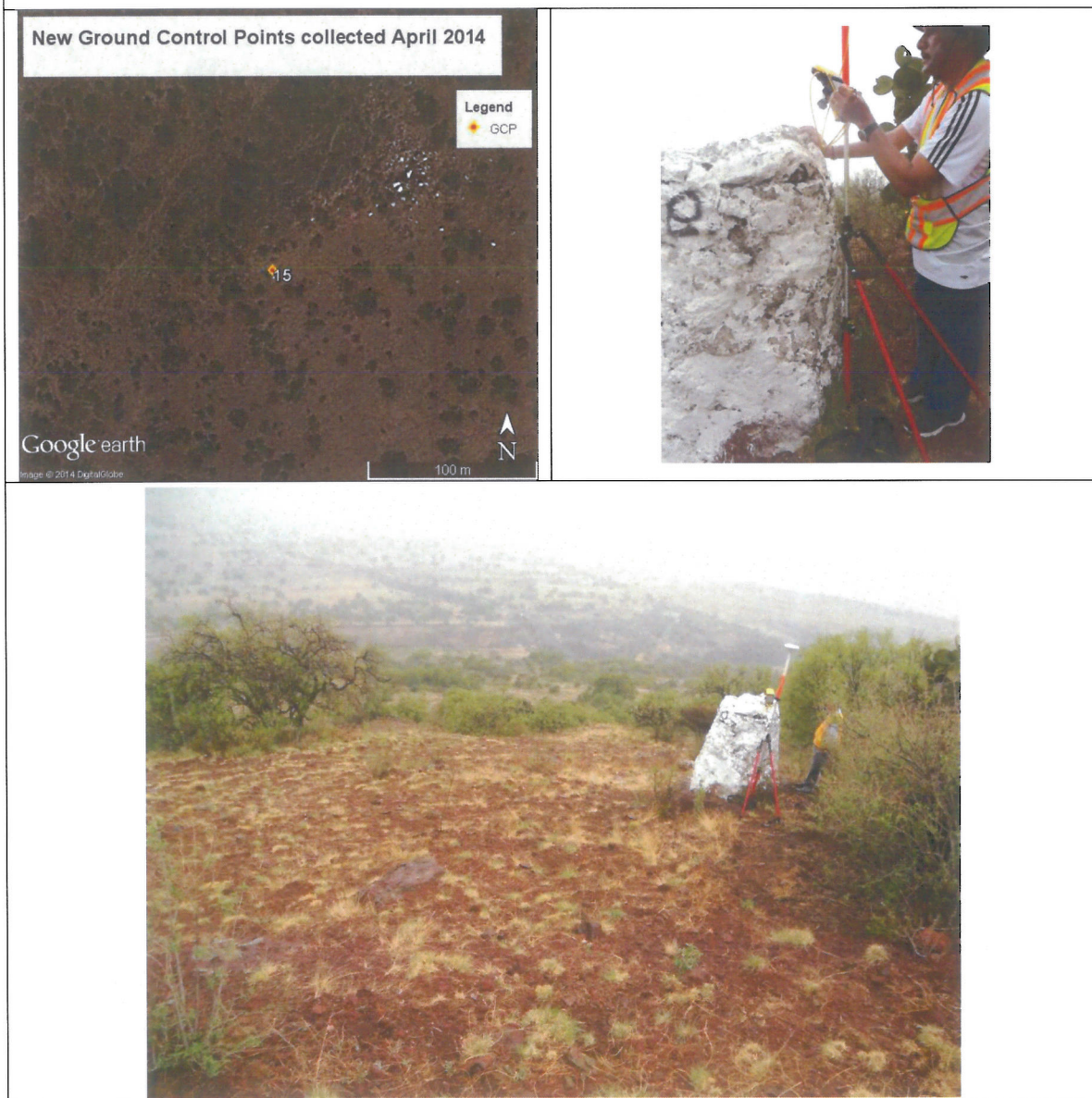


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP014	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 46' 11.74" N	Longitude: 98° 35' 2.39" W	Elevation 2447.8272m MSL
Project Area: Hidalgo Area B (football field)		Datum: WGS84/EGM96

New Ground Control Points collected April 2014

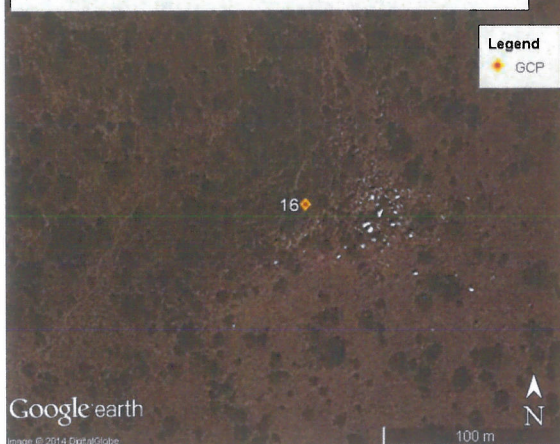


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP015	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 38' 59.29" N	Longitude: 98° 58' 4.02" W	Elevation 2561.0351m MSL
Project Area: Chiconautla Summit		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP016	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 39' 1.29" N	Longitude: 98° 58' 2.64" W	Elevation 2589.1363m MSL
Project Area: Chiconautla Summit		Datum: WGS84/EGM96

New Ground Control Points collected April 2014



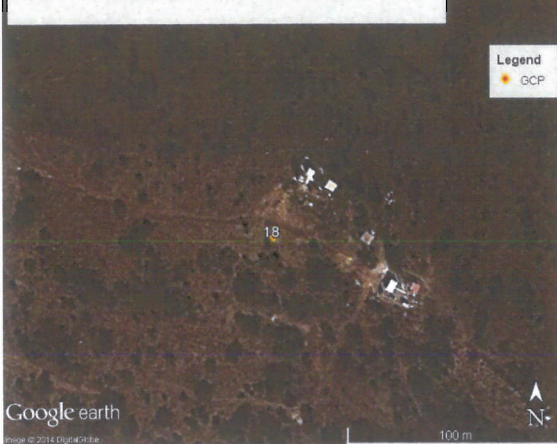
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP017	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 39' 7.08" N	Longitude: 98° 58' 4.54" W	Elevation 2588.4627m MSL
Project Area: Chiconautla Summit		Datum: WGS84/EGM96

New Ground Control Points collected April 2014

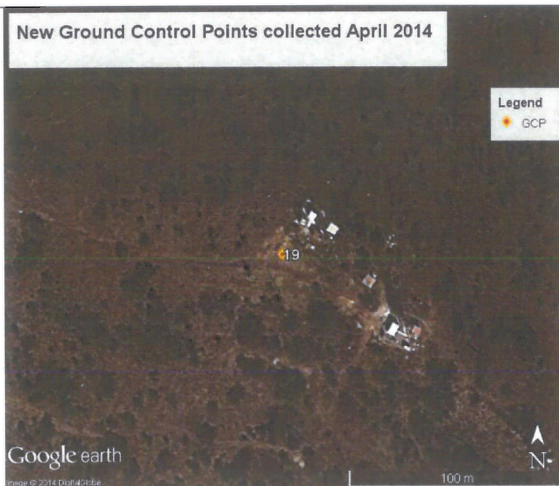


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP018	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 39' 7.86" N	Longitude: 98° 58' 6.23" W	Elevation 2587.1013m MSL
Project Area: Chiconautla Summit		Datum: WGS84/EGM96

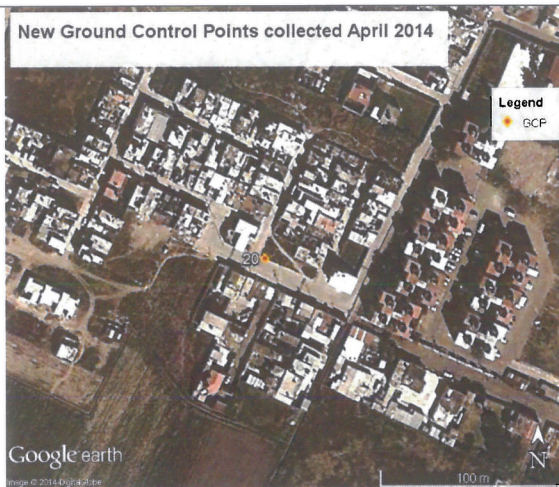
New Ground Control Points collected April 2014



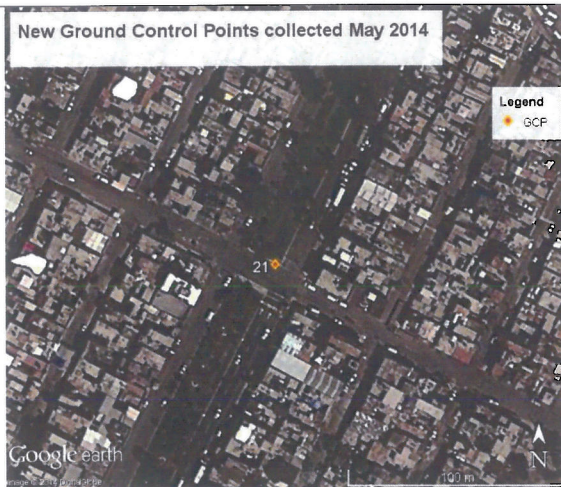
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP019	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 39' 8.24" N	Longitude: 98° 58' 6.12" W	Elevation 2588.5876m MSL
Project Area: Chiconautla Summit (Tower Elevation control point)		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP020	Collection Date: 30 April 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 38' 4.67" N	Longitude: 99° 00' 16.86" W	Elevation 2243.8286m MSL
Project Area: Chiconautla		Datum: WGS84/EGM96

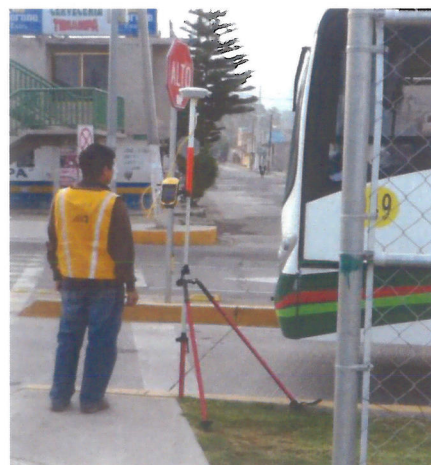


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP021	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 24' 41.51" N	Longitude: 98° 59' 26.87" W	Elevation 2227.3373m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP022	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 25' 3.87" N	Longitude: 98° 58' 35.31" W	Elevation 2228.9061m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP023	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 25' 24.46" N	Longitude: 98° 56' 43.03" W	Elevation 2233.6378m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96

New Ground Control Points collected May 2014

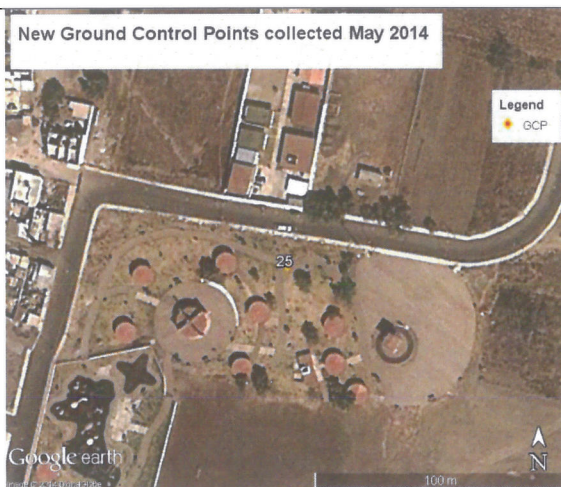


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP024	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 24' 47.22" N	Longitude: 98° 57' 4.32" W	Elevation 2322.0765m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96

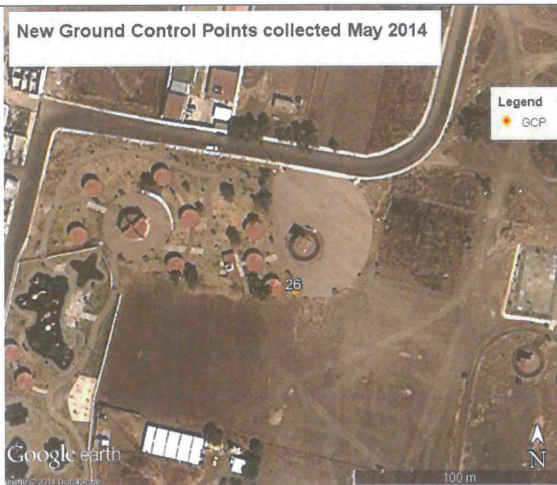
New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP025	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 24' 27.81" N	Longitude: 98° 57' 43.44" W	Elevation 2411.4074m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96

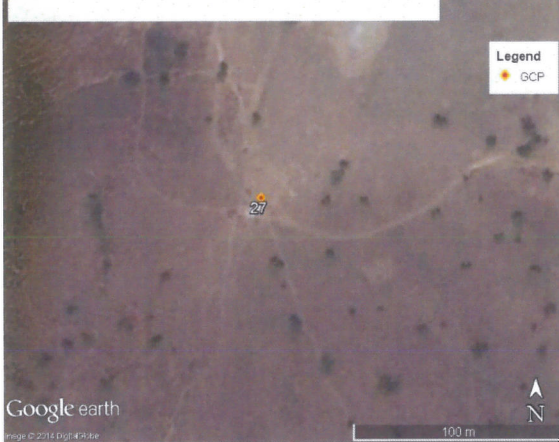


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP026	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 24' 26.12" N	Longitude: 98° 57' 42.11" W	Elevation 2409.2618m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP027	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 44.10" N	Longitude: 98° 57' 24.04" W	Elevation 2525.0441m MSL
Project Area: Chimalhuachi Hill Top		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



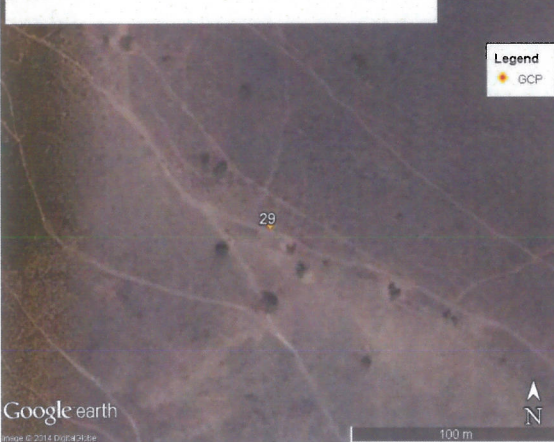
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP028	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 49.83" N	Longitude: 98° 57' 19.87" W	Elevation 2536.8117m MSL
Project Area: Chimalhuachi Hill Top		Datum: WGS84/EGM96

New Ground Control Points collected May 2014

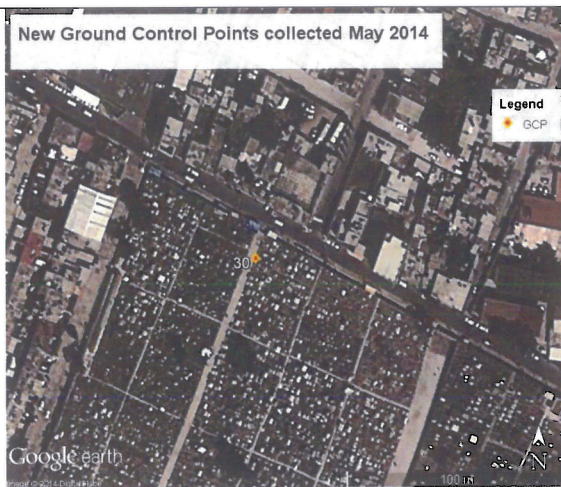


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP029	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 55.26" N	Longitude: 98° 57' 23.78" W	Elevation 2528.7591m MSL
Project Area: Chimalhuachi Hill Top		Datum: WGS84/EGM96

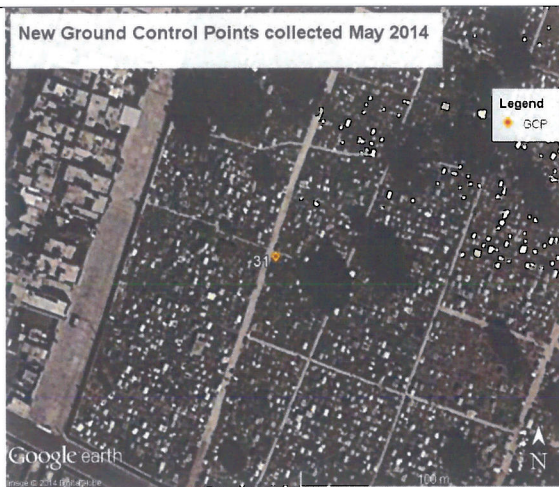
New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP030	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 35.08" N	Longitude: 98° 58' 16.65" W	Elevation 2242.7395m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP031	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 28.15" N	Longitude: 98° 58' 19.45" W	Elevation 2234.3904m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP032	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 23' 43.56" N	Longitude: 98° 56' 41.81" W	Elevation 2295.6541m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP033	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 24' 20.60" N	Longitude: 98° 57' 1.64" W	Elevation 2298.0211m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96

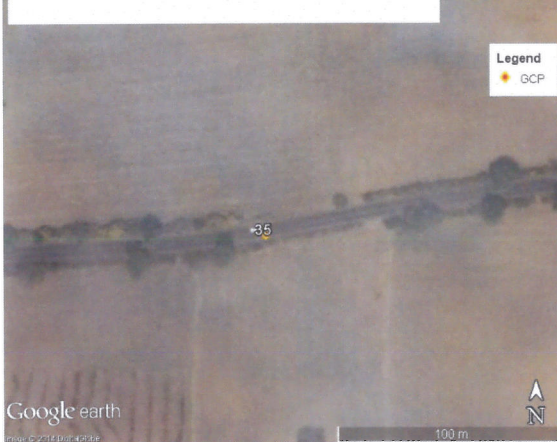


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP034	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 18' 11.31" N	Longitude: 98° 54' 51.19" W	Elevation 2250.0764m MSL
Project Area: Chimalhuacán		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP035	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 05' 39.20" N	Longitude: 98° 56' 32.03" W	Elevation 2862.4654m MSL
Project Area: Area B		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



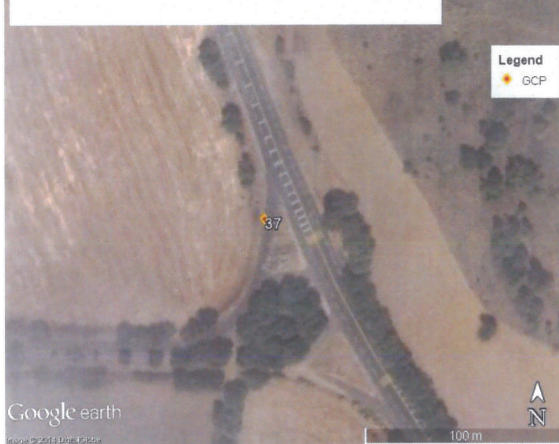
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP036	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 05' 37.76" N	Longitude: 98° 56' 33.78" W	Elevation 2862.9892m MSL
Project Area: Area B		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP037	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 05' 41.49" N	Longitude: 98° 55' 48.57" W	Elevation 2810.7896m MSL
Project Area: Area B		Datum: WGS84/EGM96

New Ground Control Points collected May 2014

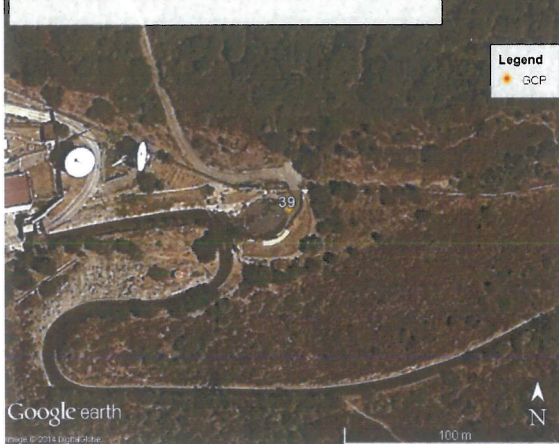


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP038	Collection Date: 01 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 17' 50.90" N	Longitude: 99° 05' 38.35" W	Elevation 2231.4577m MSL
Project Area: Area B (Xochimilco Ecological Park)		Datum: WGS84/EGM96

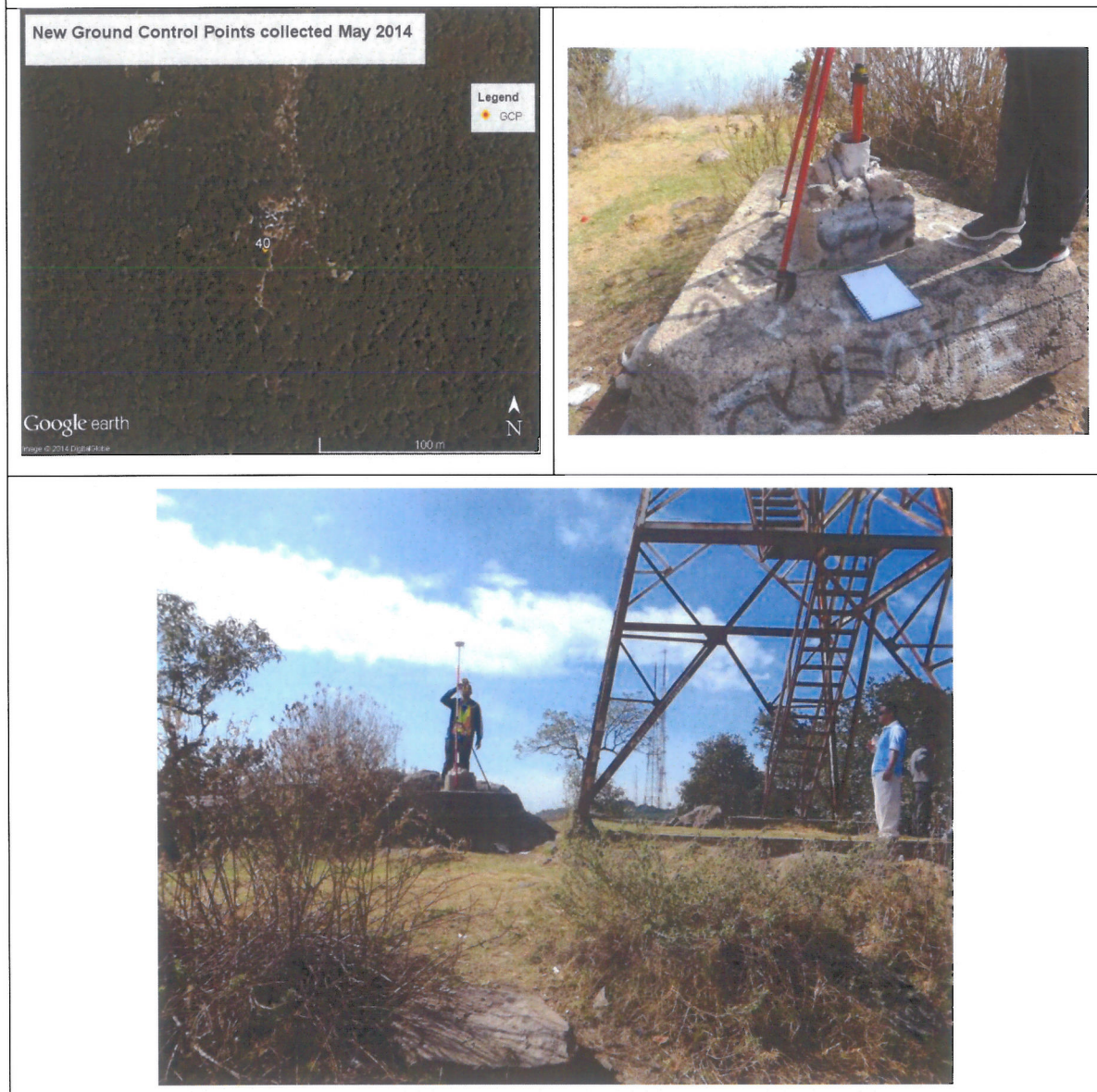


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP039	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 35' 29.45" N	Longitude: 99° 06' 50.01" W	Elevation 2957.2530m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP040	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 35' 43.81" N	Longitude: 99° 06' 58.31" W	Elevation 3008.5542m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP041	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 35' 31.18" N	Longitude: 99° 06' 58.28" W	Elevation 2990.7250 m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP042	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 35' 29.19" N	Longitude: 99° 06' 53.72" W	Elevation 2972.0426m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP043	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 31' 57.13" N	Longitude: 99° 07' 50.57" W	Elevation 2714.4195m MSL
Project Area: Chiquihuite Summit		Datum: WGS84/EGM96

New Ground Control Points collected May 2014



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP044	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 31' 59.06" N	Longitude: 99° 07' 50.22" W	Elevation 2721.5775m MSL
Project Area: Chiquihuite Summit		Datum: WGS84/EGM96

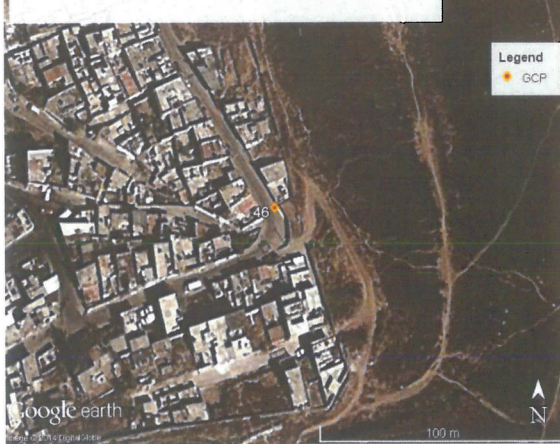


Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP045	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 33' 0.71" N	Longitude: 99° 09' 45.32" W	Elevation 2315.2367m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP046	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 34' 13.23" N	Longitude: 99° 10' 53.18" W	Elevation 2352.2909m MSL
Project Area: Sierra de Guadalupe		Datum: WGS84/EGM96

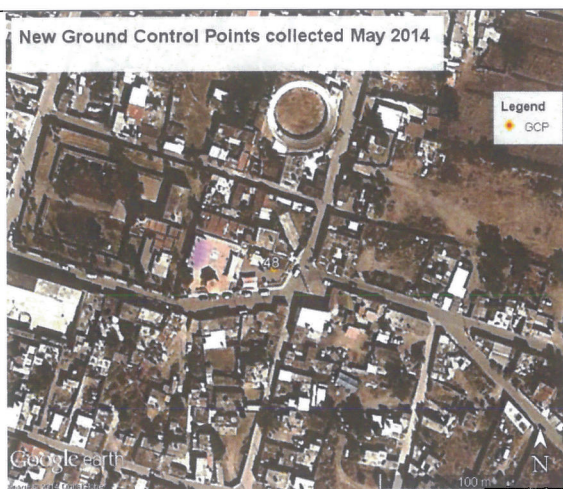
New Ground Control Points collected May 2014



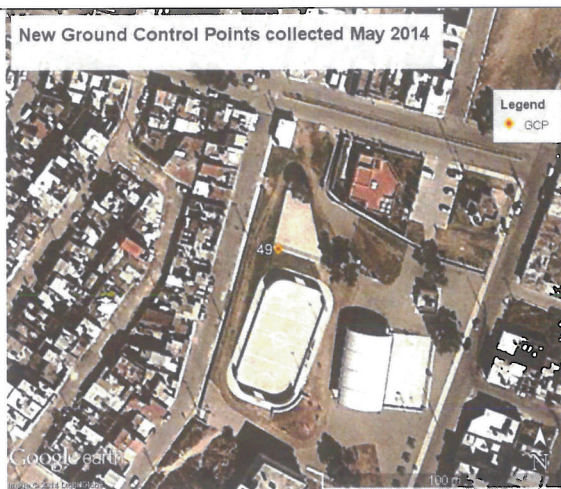
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP047	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 44' 31.10" N	Longitude: 98° 58' 20.12" W	Elevation 2245.0966m MSL
Project Area: Tecámac Near PSA		Datum: WGS84/EGM96



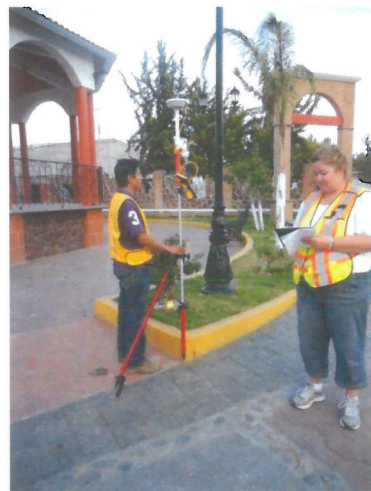
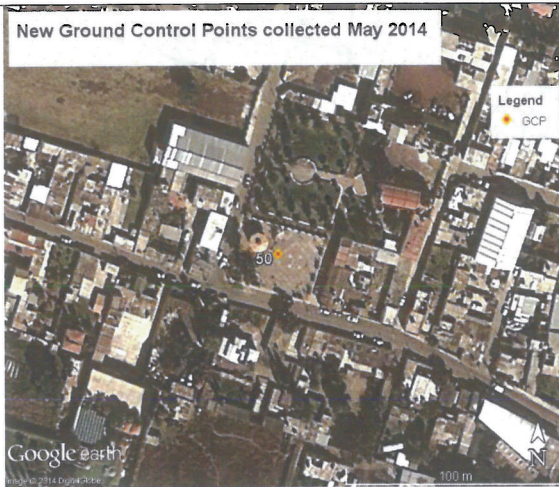
Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP048	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 40' 20.52" N	Longitude: 98° 57' 29.32" W	Elevation 2357.2047m MSL
Project Area: Chiconautla		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP049	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 39' 39.34" N	Longitude: 98° 59' 43.51" W	Elevation 2322.4546m MSL
Project Area: Chiconautla		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP050	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 37' 9.25" N	Longitude: 98° 57' 46.62" W	Elevation 2246.0688m MSL
Project Area: Chiconautla		Datum: WGS84/EGM96



Project: Texcoco Area Survey	Country: Mexico	Region: Texcoco Area, Mexico
Control Point ID: GCP051	Collection Date: 02 May 2014	Instrument: Trimble GeoExplorer
Latitude: 19° 28' 50.58" N	Longitude: 98° 58' 19.53" W	Elevation 2226.9591m MSL
Project Area: PSA		Datum: WGS84/EGM96

New Ground Control Points collected May 2014

