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Ministry of Housing and Public Works

Urban Development Directorate

82, Segunbagicha, Dhaka- 1000

Report on

UAV IMAGE CAPTURE, PROCESSING, GEO-REFERENCING, 3-D DIGITIZATION ALONG WITH DIGITIZED DATABASE under **Preparation of Development Plan for Meherpur Zilla**



Submitted by
TILLER-GEOMARK LIMITED JV



TILLER

Level-10 & 11, House-01, Road-03

Block-A, Section- 6, Mirpur, Dhaka



House 33, Road 12, Pisciculture Housing Society

Mohammadpur, Dhaka, Bangladesh

Executive Summary

The Urban Development Directorate (UDD), under the Ministry of Housing and Public Works of Bangladesh, has initiated the "Preparation of Development Plan for Meherpur Zilla" project, with the objective of formulating comprehensive structure, urban, and rural area plans. As part of this initiative, the consulting team was tasked with the preparation of UAV-based physical features, topographic, and land use GIS databases, along with mouza map collection, digitization, and base map generation.

This report presents the outcomes of aerial mapping using Unmanned Aerial Vehicles (UAVs), photogrammetric data processing, and 3D feature extraction for the creation of detailed base maps for Meherpur district, comprising Meherpur Sadar, Mujibnagar, and Gangni Upazilas. The study covered over 750 sq.km. and utilized high-resolution UAV imagery with enhanced ground sample distance and overlap specifications for maximum accuracy.

A total of 462 flight blocks were designed and executed across the district, and 1,836 Ground Control Points (GCPs) were strategically marked and surveyed using RTK-GPS technology to ensure precise geospatial referencing. The UAV images were processed using advanced photogrammetric methods, enabling the development of orthophotos and the extraction of 3D physical features.

The final output includes:

- Orthophotos for each Upazila
- Extracted 3D Digitized features including physical infrastructure, road networks, Waterbody and other features.

This comprehensive spatial data framework lays a robust foundation for the formulation of effective and sustainable development plans for Meherpur Zilla. The report concludes with recommendations for the integration of this data with output from other ongoing studies and for maintaining the database for future updates and planning needs.

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Chapter 1: Introduction

1.1 Project Background

The Urban Development Directorate (UDD), Ministry of Housing and Public Works, Government of the people's Republic of Bangladesh has taken a great initiative to prepare development plan for Meherpur District under the project titled "Preparation of Development Plan for Meherpur Zilla" funded by the Government of Bangladesh. The aim of this project is to prepare a structure plan, Urban Area Plan and Rural Area Plan including Pourashava, Union Level and Growth Center Plan. The preparation of the development plan requires existing situational analysis based on the existing physical, topographic and land supply of the project area. In this context, under the "Preparation of Development Plan for Meherpur District" project, we the consultant has been contracted to conduct physical feature, land use and topographic survey and to assist in preparation of the development plan. Along with the preparation of physical features, land use and topographic database, the consultant would integrate data obtained from the other firms for the same project to develop a comprehensive database for the project.

1.2 Project Objectives

The objectives of the project include

- To assist in preparing **Development Plan for Meherpur district** by developing physical feature, topographic and landuse database
- To establish **Benchmark (BM) pillar** in the project area
- To prepare **3D model** of the project area
- To **relate the output of the surveys and database** with that of other attribute data and activities prepared by other consultants

1.3 Understanding the Scope of Services

To achieve the objectives of this project the consultant will be responsible for the development of GIS Database (spatial and attribute) by conducting physical feature, landuse, and topographic surveys. Apart from the surveys and GIS database preparation, the consultant will be responsible for relating the output of the surveys and database with that of other attribute data and activities, which would be imparted by other consultants e.g., geological study. The **scope of service** under this assignment, including detailed breakdown of activities and specifications, has been outlined in the following table:

- i. Construction and Establishment of **Benchmark (BM)** pillar
- ii. Preparation of **Base Map** through **using digitized physical features and mouza map**
- iii. **Physical Feature Survey**
- iv. **Topographic Survey**
- v. Existing **Land Use Survey**
- vi. Relating the output of the surveys and database with that of **other attribute data and activities** prepared by other consultants



Chapter 2: Study Area Profile

The Meherpur district gained its district status on 1984, and later in 2000, Meherpur Sadar Upazila was split to establish Mujibnagar Upazila. Presently, Meherpur district comprises 3 upazilas, 18 unions, 180 Mouzas, 285 villages, 2 paurashavas, 18 wards and 100 mahallas. The upazilas of Meherpur district are Meherpur Sadar, Gangni and Mujibnagar.

As we are in the **Inception Phase of the project**, we have gathered and reviewed all relevant **plans and policies** for the project area. Additionally, we have **reviewed and detailed basic statistics** of the study area using **BBS reports, journals, and other secondary materials relating to Meherpur District**.

These data sources provide insights into the **demographic, economic, social, and environmental aspects** of the district.

The following sections present the reviewed materials, offering a detailed overview of our findings and analysis. This information serves as a foundation for the subsequent phases of the project, ensuring a well-informed and strategic approach moving forward.

2.1 Location

Meherpur district, situated in Bangladesh, is bordered by Kushtia district to the north, Chuadanga district to the east and south, and India to the south and west. It covers a total area of **751.62 sq.km.** (290 sq.miles) and lies between 23°44' and 23°59' north latitude, and 88°34' and 88°53' east longitude. It is the border district of western part of Bangladesh. Before the partition (1947) Meherpur was a part of the Nadia district of India.

Table 2-1: Meherpur District at a glance (Upazila, Union & Municipality)

Sl. No.	Upazila (Area)	Union	Municipality (Area)
1	Meherpur Sadar (276.15 sq.km.)	Kutubpur, Buripota, Amjapi, Amdah, Pirojpur	Meherpur Municipality (17.60 sq.km.)
2	Mujibnagar (111.51 sq.km.)	Dariapur, Monkhali, Baguan, Mahajanpur.	-
3	Gangni (363.95 sq.km.)	Kathuli, Tetulbaria, Kazipur, Bamandi, Saharabati, Dhanakhola, Raipur, Matmura, Sholtaka.	Gangni Municipality (16.84 sq.km.)

Source: Bangladesh National Portal, 2024; Gangni Paurashava Master Plan: 2011-2031; Meherpur Paurashava Master Plan: 2017-2037

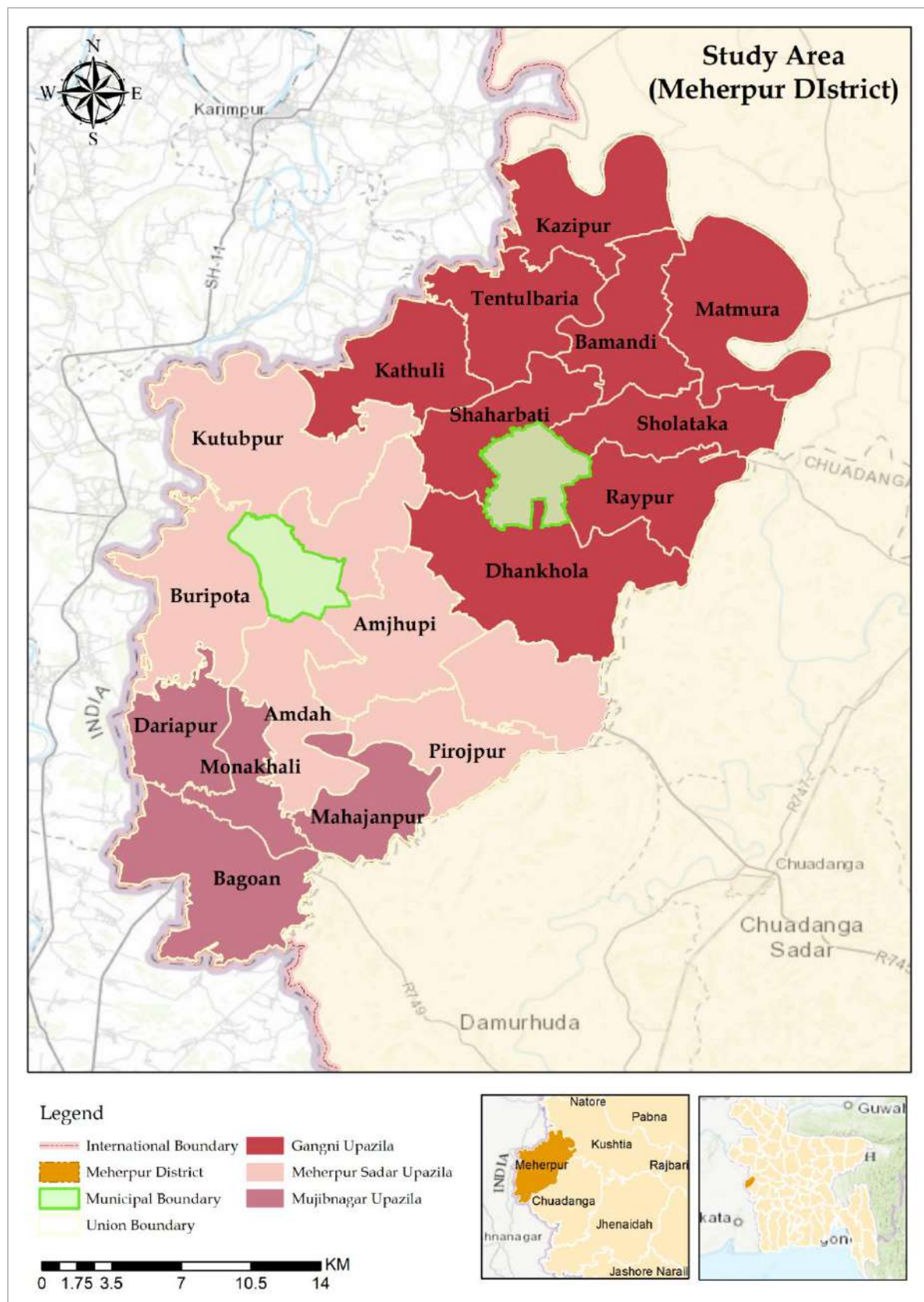


Figure 2-1: Location of Meherpur district



2.2 Historical Significance

Meherpur is known as the first capital of Bangladesh as because the first temporary Government of Bangladesh was formed at Mujibnagar, Meherpur on 17 April 1971. The first cabinet of Bangladesh was formed and took their oath at historical "Ambagan" of Boddonathtala (Now Mujibnagar). Some of the **remarkable places of Meherpur District** are mentioned below:

- Mujibnagar Remembrance Complex
- Bhawanandpur Temple
- Amda Architecture of Amda Village
- Balaram Hari Temple
- Amzapi Nilkuthi
- Nilkuthi of Bhatpara, Saharbat
- Swami Nigamananda Ashram
- The Ballolpur Church, Bhabar Para etc.

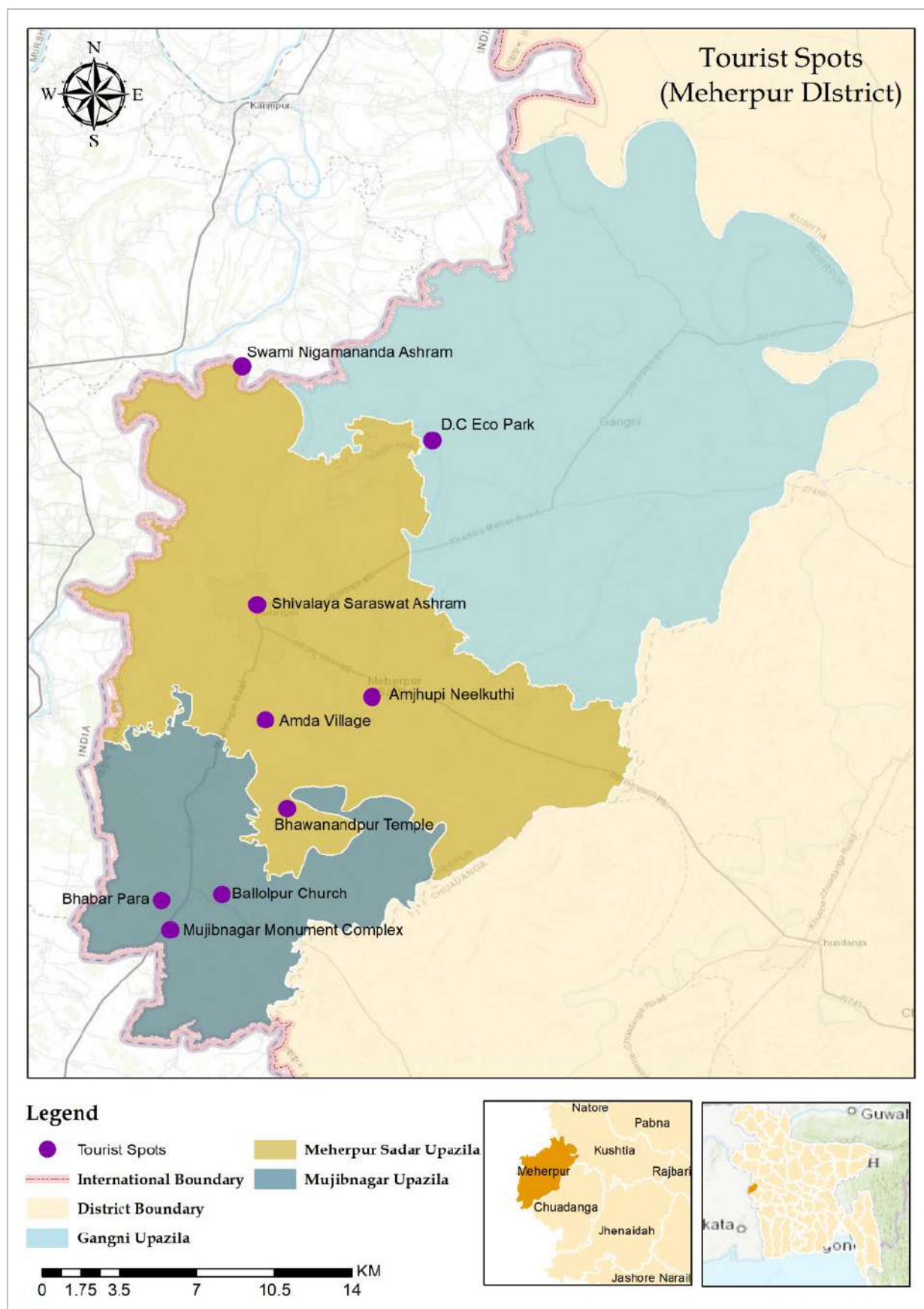


Figure 2-2: Location of Tourist Spots



Chapter 3: UAV Image Capturing, Processing & Photogrammetric Method

Photogrammetry is the science of measuring photographs. Photogrammetry allows you to identify the size, form, and position of portrayed things by measuring them in a picture, without having to physically contact the object. The photogrammetric approach can be used to a single image, a stereo pair, or a collection of two or more photos. Measurement in a single photograph can only provide 2D coordinates, however 3D coordinates may be derived by capturing two or more images of the same item from various places. This is known as stereoscopic seeing or stereophotogrammetry. To construct this project's risk-sensitive database, we have employed UAV photos which is acquired from various places to derive 3D coordinates using the photogrammetric approach.

3.1 Aerial Mapping

As per the communication with PD and requirements of the **ToR** the following specification has been adopted while doing aerial mapping. The details are given below-

Table 3-1: Specification of Aerial Mapping as per ToR and Considered

Sl. No	Description	Specification as per ToR	Considered Specification
01	Raw Images	Ground Sample Distance: 10CM Side overlap: Minimum 60% Forward Overlap: Minimum 70% Image coordinate: X, Y, Z Image Orientation: Roll, Pitch, Yaw or Omega, Phi, Kapa	•Ground Sample Distance: 5CM •Side overlap: Minimum 70% •Forward Overlap: Minimum 80%
02	GCP	RTK Grade GCP Horizontal Accuracy: (+/-) 2.5 cm Vertical Accuracy: (+/-) 5 cm	•Real-time Kinematic Horizontal accuracy: Hz 8 mm + 1 ppm / V 15 mm + 1 ppm • Static Vertical accuracy: 3.0 mm + 0.4 ppm
03	Aerial Triangulation Report	Accuracy of the Aerial Triangulation in PDF format	Aerial Triangulation Report containing the overall accuracy of the process will be provided in PDF format
04	Orthophoto	Geo-Tiff format 10 CM spatial resolution (Not resample) Color Balanced	Geo-Tiff format 10 CM spatial resolution (Not resample) Color Balanced

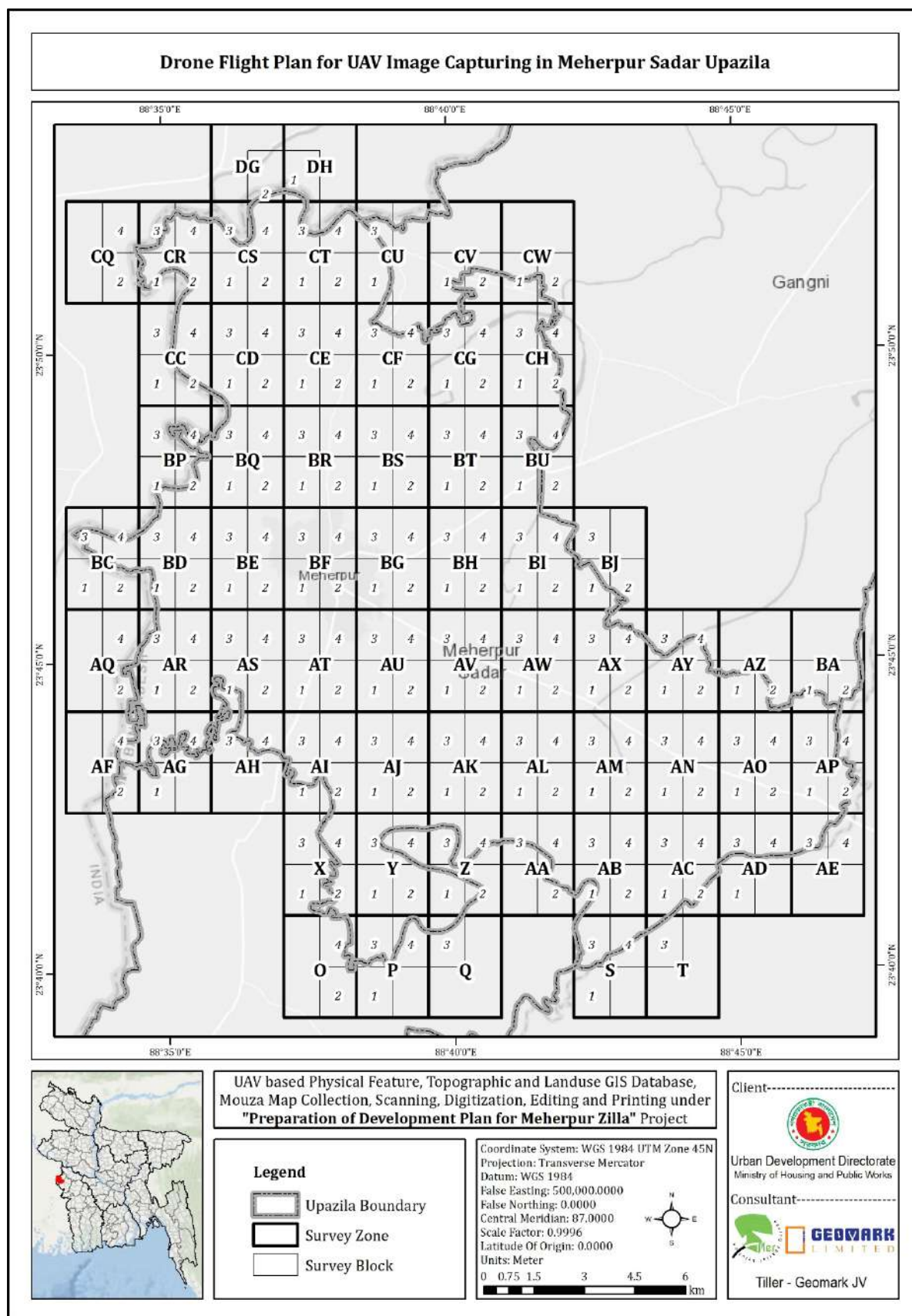
Source: Prepared by the consultant.

3.2 UAV Image Acquisition

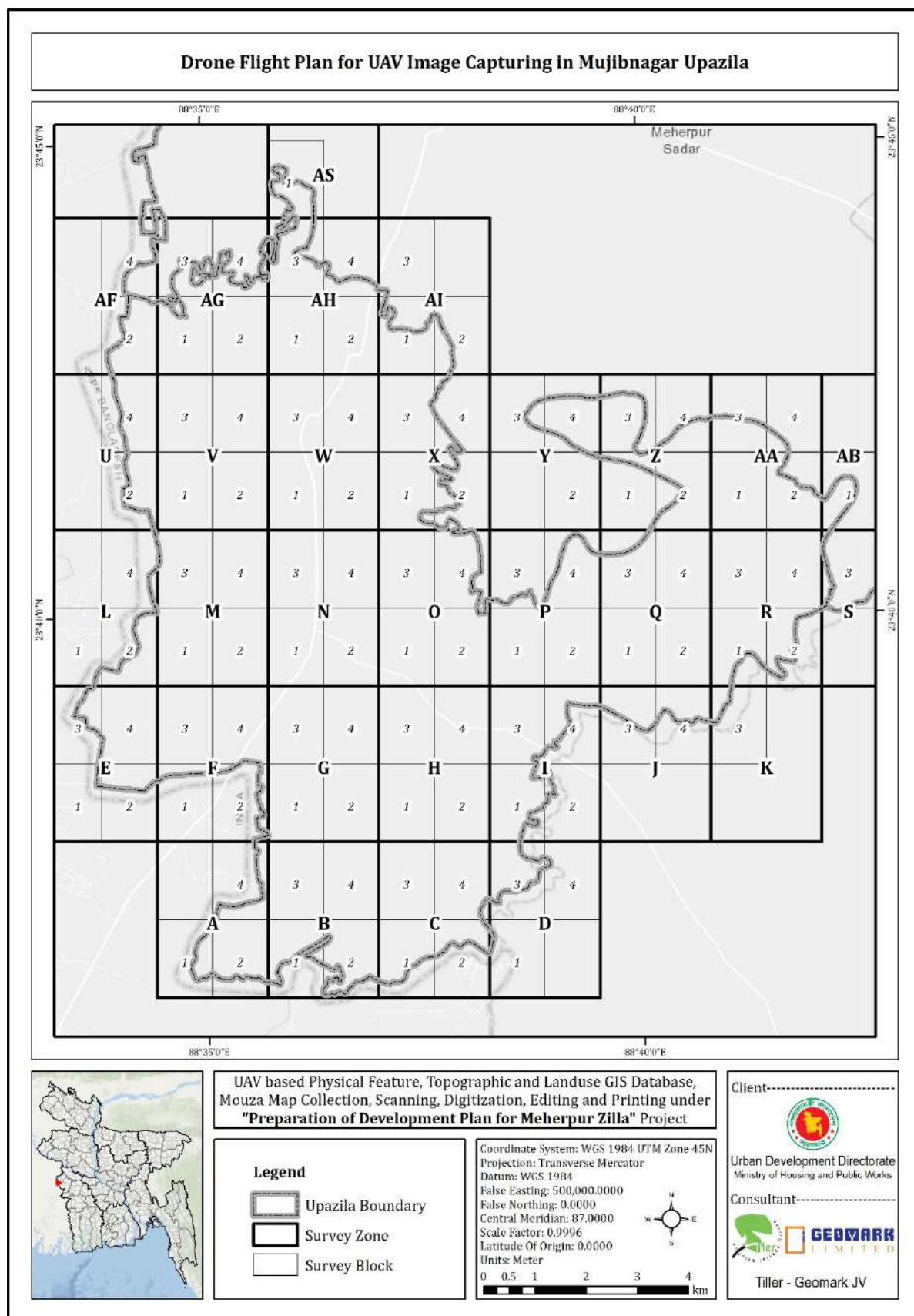
The consultant has determined the precise area that must be covered by the UAV flight. Subsequent task, including UAV Flight Path Set, UAV Flight Block, and GCP marking, has been carried out accordingly. The established flight plan was set with the **185 meters** altitude and few other technical parameters in order to acquire accurate photographs with a UAV for the entire project areas.

3.2.1 UAV Flight Blocks

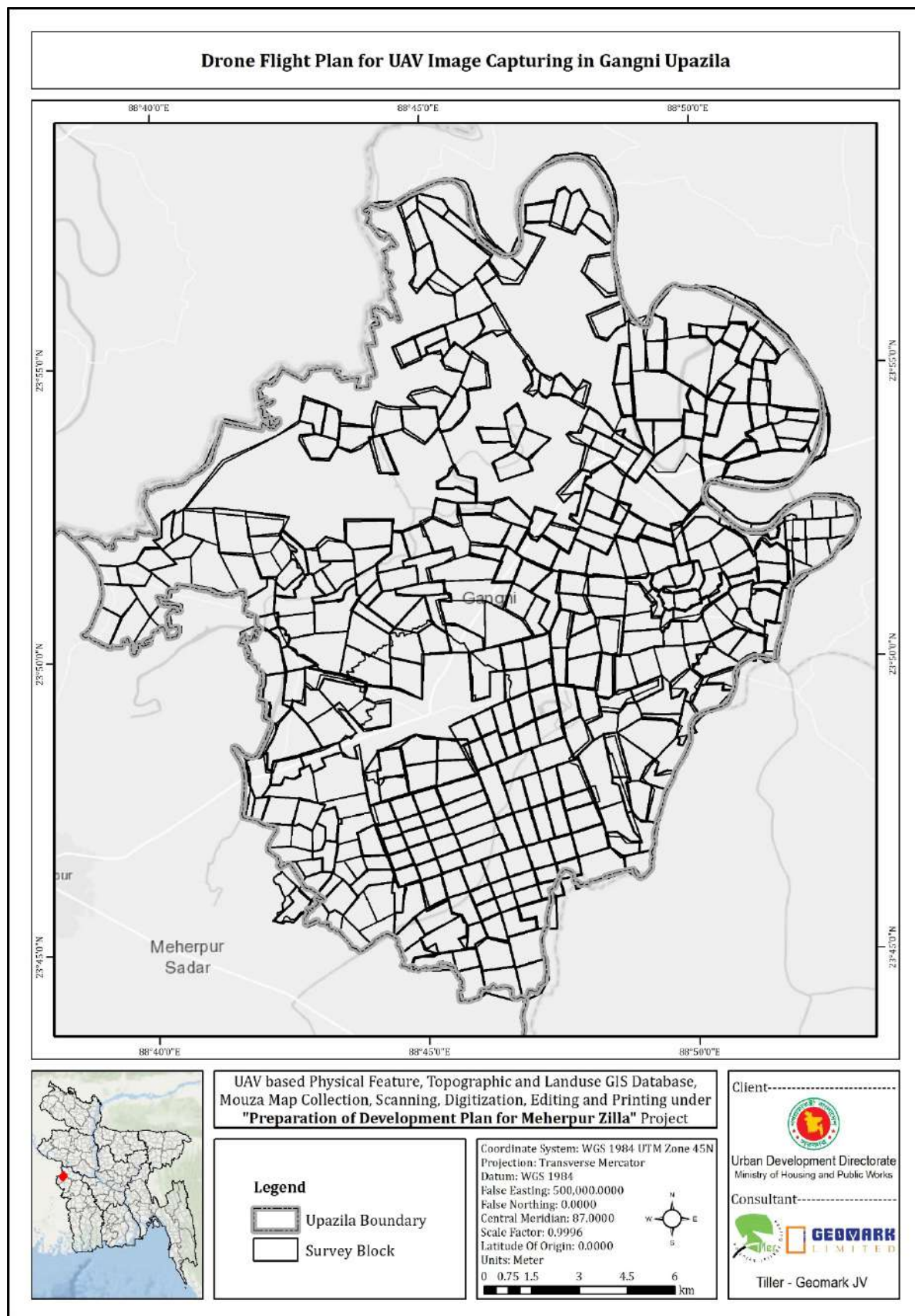
The UAV flight blocks of three upazilas (Meherpur Sadar, Mujibnagar and Gangni) of Meherpur District are attached in the following.



Map 3-1: Drone Flight Plan for UAV Image Capturing in Meherpur Sadar Upazila



Map 3-2: Drone Flight Plan for UAV Image Capturing in Mujibnagar Upazila



Map 3-3: Drone Flight Plan for UAV Image Capturing in Gangni Upazila



Figure 3-1 UAV Flight Overview (Instrumental Quality Check) of Meherpur Sadar Upazila

The entire project area of Meherpur District is divided into 462 flight blocks. Each flight blocks of Meherpur Sadar and Mujibnagar Upazilas are 1080 meters width and 1520 meters length. All the blocks are 405.6 acres in size. On the other hand, Gangni Upazila has 174 flight blocks.

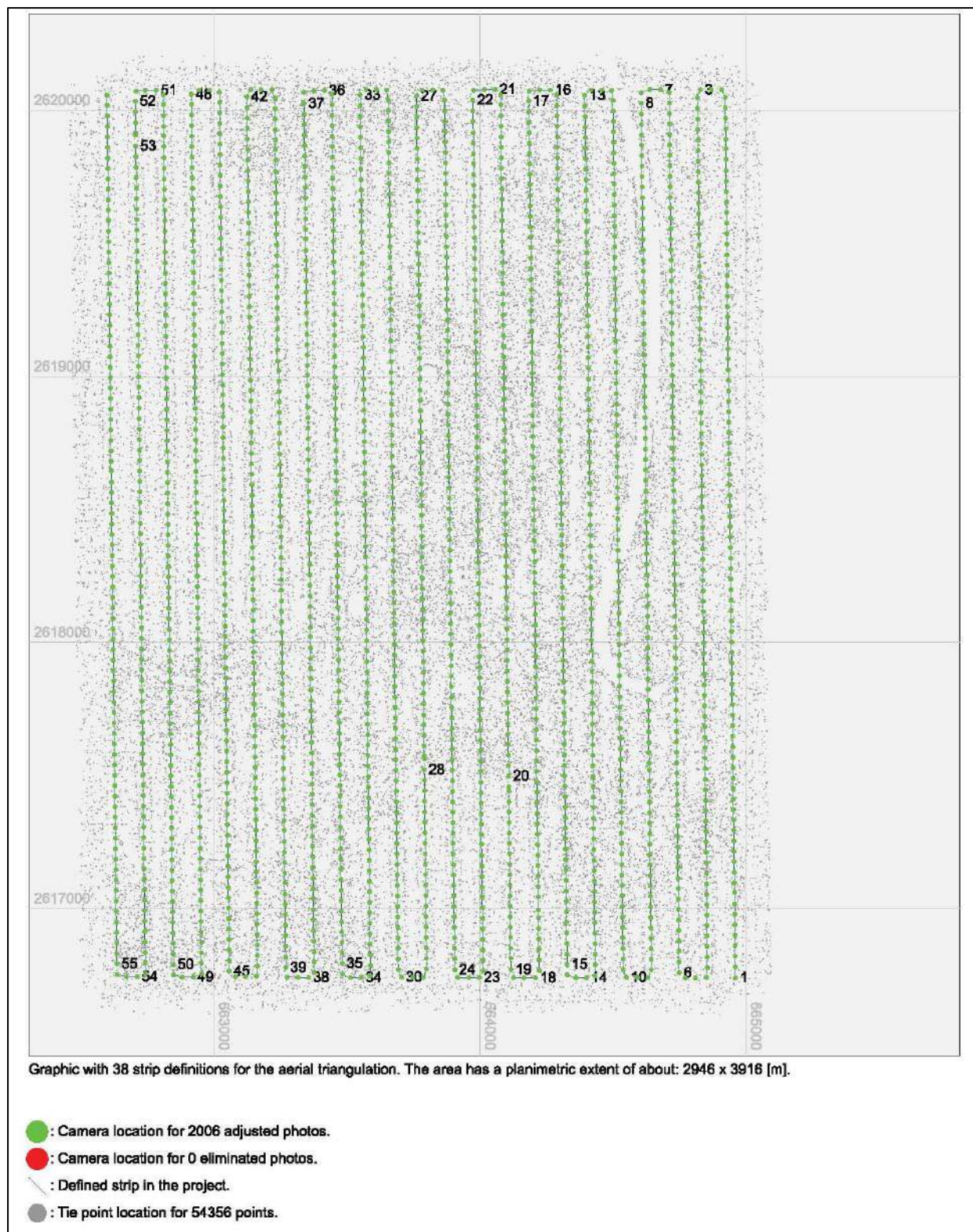


Figure 3-2 UAV Flight Overview (Instrumental Quality Check) of Mujibnagar Upazila

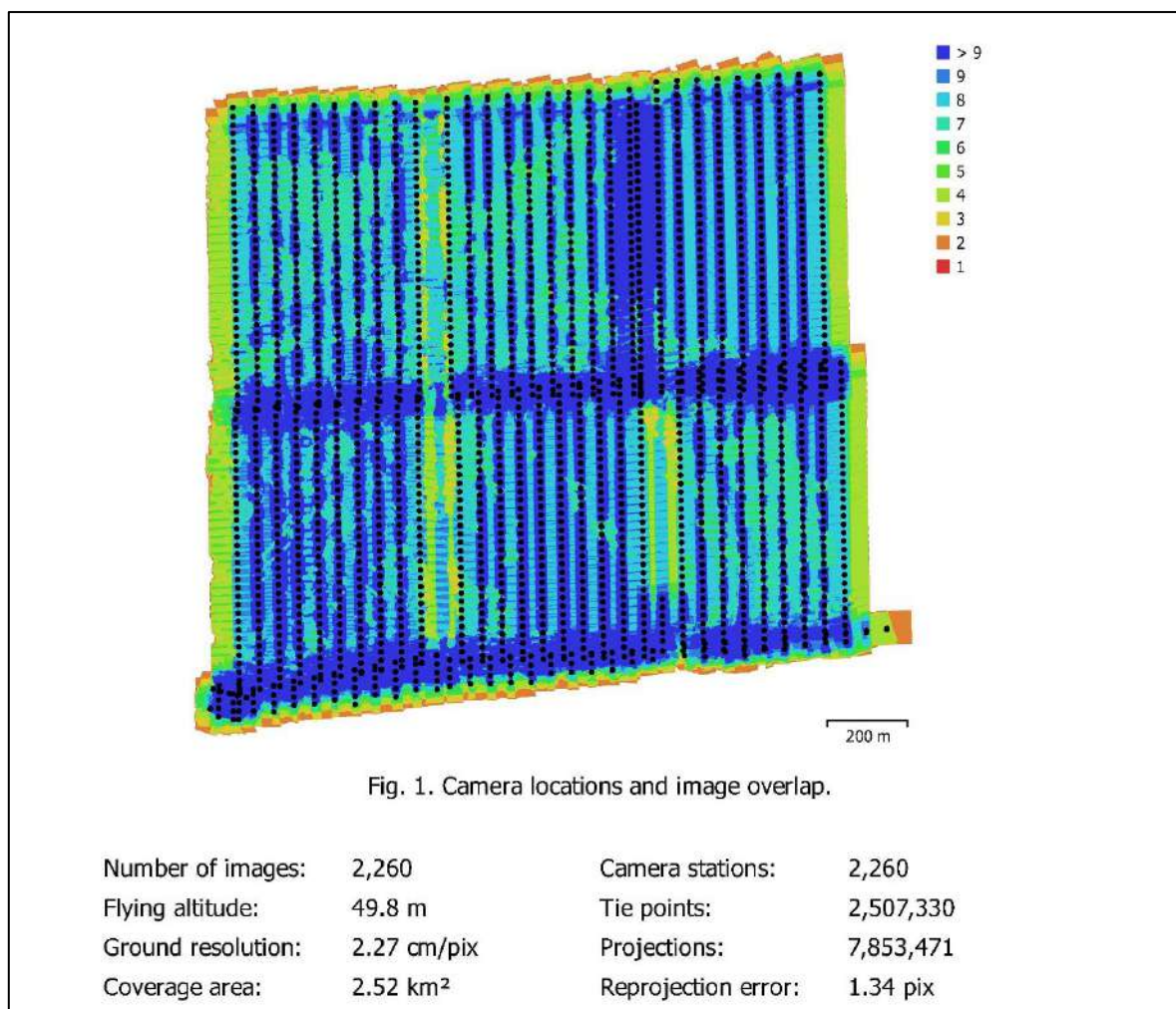


Figure 3-3 UAV Flight Overview (Instrumental Quality Check) of Gangni Upazila

3.2.2 GCP Selection, Marking & Value Establishment

UAV Image capturing team has marked first different locations first and measured their location (X, Y, Z) with RTK GPS. GCP points is be scattered throughout the entire project area evenly. Afterwards, all of these locations have been corrected with the nearest benchmark (BM) pillar values set out by Survey of Bangladesh (SoB). Physical markers with known coordinates placed in the survey area which has been used to improve the accuracy of the georeferenced data. There is a total of 193 selected GCPs in Meherpur Sadar Upazila, 75 GCPS are in Mujibnagar Upazila and 1568 GCPs are in Gangni Upazila.

3.2.2.1 GCP Selection

The Ground Control Points (GCPs) have been thoughtfully designated on the maps in accordance with the established flight plan. While selecting GCPs, careful consideration was taken of their strategic distribution across the survey areas. The selection criteria prioritized the points that possess clear visibility in both the acquired aerial imagery and when observed on the ground. Furthermore, these selected GCPs are the representative of the terrain and pertinent



objects within the project areas, thus contributing to the precision and applicability of the UAV images. The app generated sample report is given in Table 3-2, 3-3:

Table 3-2: Sample Ground Control Points (GCP) from Statistic File (Meherpur Sadar Upazila)

ID	Type	X	Y	Z	Unit	Remark
GCP-107	Full	662714.1599	2626014.0890	12.8807	m	
GCP-109	Full	663883.1891	2626038.3180	10.8663	m	
GCP-111	Full	664724.9756	2626060.7410	15.0284	m	
GCP-113	Full	665769.3433	2625912.6110	15.3140	m	
GCP-115	Full	667024.0842	2625986.1600	12.4314	m	
GCP-145	Full	662789.6992	2629147.3270	14.5037	m	
GCP-146	Full	662784.6349	2627538.3730	14.2824	m	
GCP-147	Full	663719.7138	2629139.0800	14.8806	m	
GCP-148	Full	663644.0819	2627511.2840	14.6516	m	
GCP-149	Full	664903.2263	2629074.7730	12.3610	m	
GCP-150	Full	664848.8230	2627454.3730	14.5199	m	
GCP-151	Full	665968.0374	2629026.5410	8.5281	m	
GCP-152	Full	666176.2283	2627616.6930	14.3935	m	
GCP-153	Full	666960.3105	2629150.6160	14.2749	m	
GCP-154	Full	666939.3700	2627774.8780	14.3577	m	
GCP-189	Full	662657.9226	2632059.9070	15.4086	m	
GCP-190	Full	662725.1857	2630618.6690	12.4806	m	
GCP-191	Full	664160.1394	2632161.6490	15.5439	m	
GCP-192	Full	663861.6457	2630639.4550	14.3344	m	
GCP-193	Full	664938.0407	2632114.5160	14.6247	m	
GCP-194	Full	664927.0145	2630720.9630	14.9512	m	
GCP-195	Full	666196.6533	2632034.1510	14.5422	m	
GCP-196	Full	666084.0037	2630541.7440	14.8219	m	
GCP-197	Full	667096.4582	2632043.0510	13.0954	m	
GCP-198	Full	666963.5202	2630519.3200	14.1598	m	
Minimum		662657.9226	2625912.6110	8.5281	m	selected system
Maximum		667096.4582	2632161.6490	15.5439	m	selected system
Area extent		4438.5356	6249.0380	7.0158	m	selected system



Table 3-3: Ground Control Point (GCP) Residuals (Given - Adjusted)

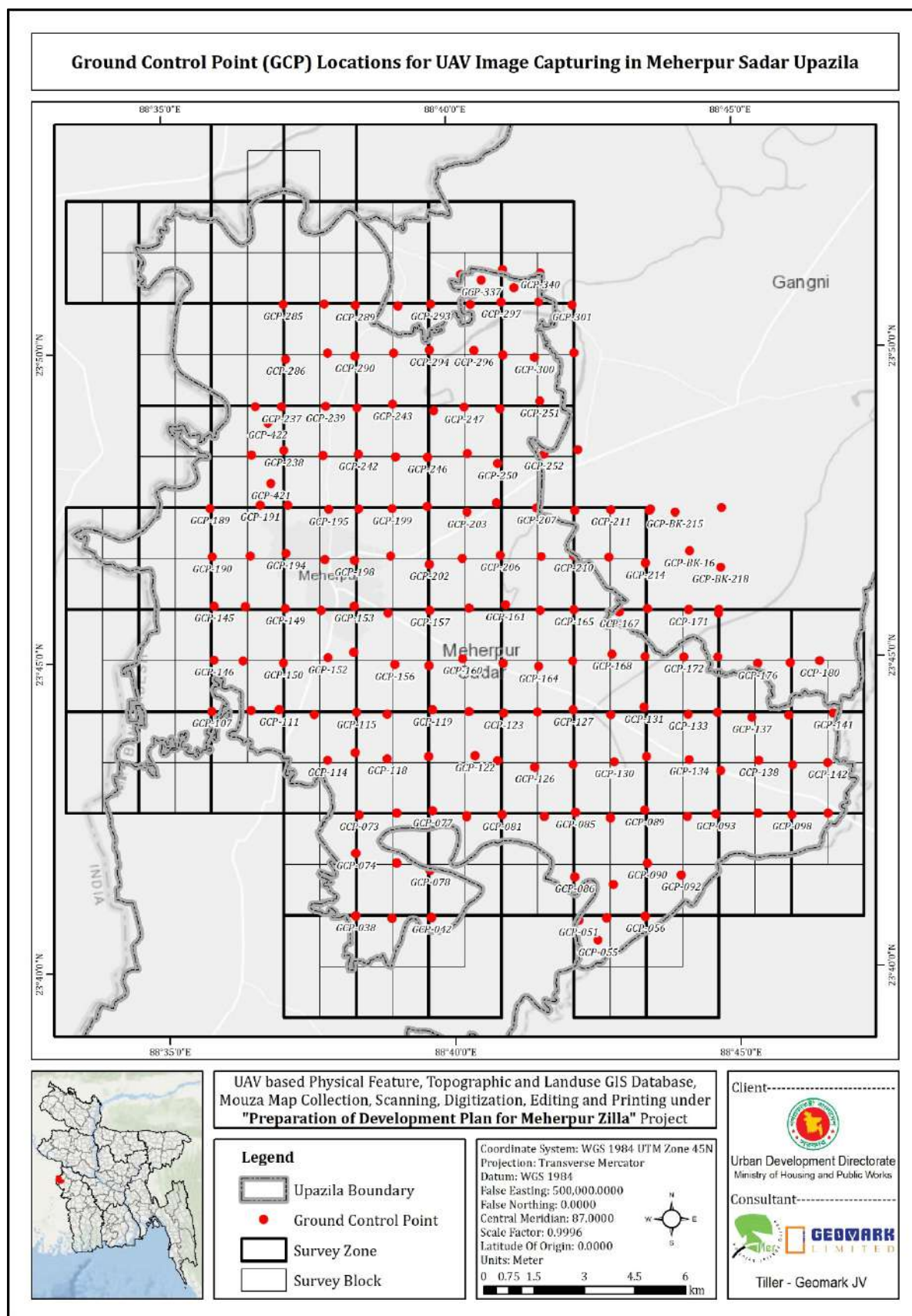
ID	#	X [m]	Y [m]	Z [m]	Total [m]	Remark
GCP-107	17	0.0018	-0.0013	0.0041	0.0047	
GCP-109	18	-0.0022	-0.0379	-0.0063	0.0385	
GCP-111	21	-0.0340	-0.0180	0.0062	0.0390	
GCP-113	15	-0.0067	-0.0007	0.0010	0.0068	
GCP-115	19	-0.0040	0.0040	-0.0072	0.0091	
GCP-145	24	0.0027	-0.0041	0.0079	0.0093	
GCP-146	12	0.0071	-0.0121	0.0039	0.0146	
GCP-147	26	0.0067	0.0283	-0.0078	0.0302	
GCP-148	16	0.0629	-0.0039	-0.0058	0.0633	
GCP-149	55	-0.0169	0.0487	0.0030	0.0516	
GCP-150	28	-0.0263	0.0155	0.0010	0.0306	
GCP-151	33	0.0000	0.0200	-0.0005	0.0200	
GCP-152	15	-0.0170	0.0057	0.0071	0.0192	
GCP-153	24	0.0190	0.0093	-0.0019	0.0212	
GCP-154	9	0.0024	0.0079	-0.0027	0.0087	
GCP-189	10	-0.0017	-0.0011	-0.0032	0.0038	
GCP-190	16	-0.0093	-0.0004	-0.0015	0.0095	
GCP-191	13	-0.0087	-0.0099	0.0023	0.0134	
GCP-192	7	-0.0027	-0.0095	-0.0043	0.0107	
GCP-193	30	-0.0098	-0.0129	-0.0022	0.0163	
GCP-194	23	-0.0205	0.0082	0.0002	0.0221	
GCP-195	9	0.0073	-0.0404	-0.0003	0.0410	
GCP-196	13	0.0148	0.0103	-0.0000	0.0180	
GCP-197	11	0.0099	0.0016	0.0046	0.0111	
GCP-198	11	0.0253	-0.0075	0.0024	0.0266	
Maximum		0.0629	0.0487	0.0079		
Mean		0.0000	0.0000	-0.0000		
Sigma		0.0190	0.0184	0.0044		
RMSE(x,y,z)		0.0186	0.0181	0.0043		
RMSEr		0.0259	SQRT(RMSE _x * RMSE _x + RMSE _y * RMSE _y)			
ACC _r (at 95% Confidence Level)		0.0449	RMSE _r * 1.7308			
ACC _z (at 95% Confidence Level)		0.0084	RMSE _z * 1.9600			

3.2.2.2 GCP Marking

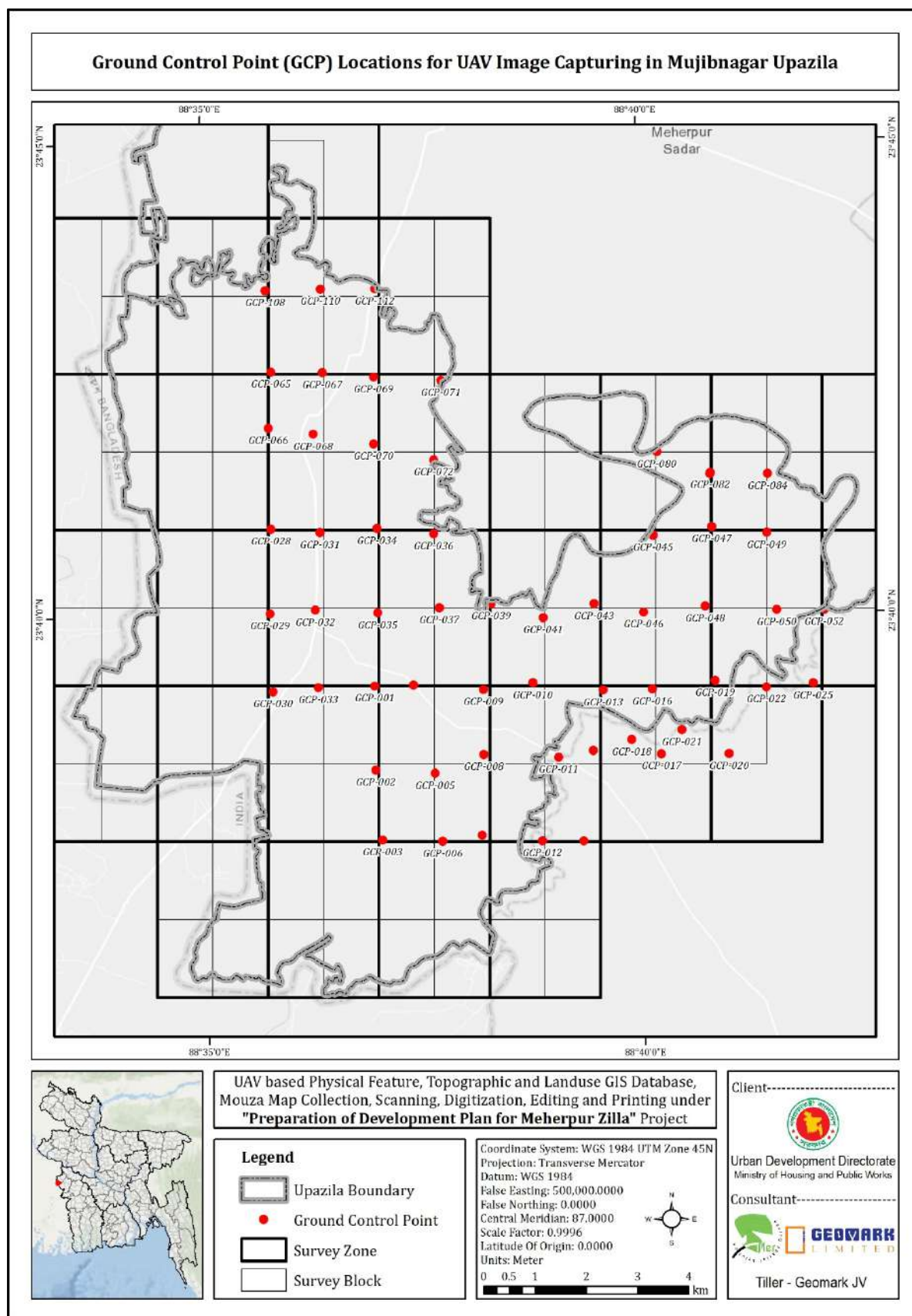
In order to guarantee the clear identification of the Ground Control Points (GCPs) within the aerial images, essential measures were undertaken. At each designated GCP location, markers were positioned precisely that, took the form of a tangible objects, such as meticulously painted targets or conspicuously reflective markers, carefully chosen for their capacity to be readily visible from the flying Unmanned Aerial Vehicle (UAV). This meticulous approach ensures the unambiguous recognition of GCPs within the aerial imagery, thus contributing to the accuracy and reliability of the processed UAV images.



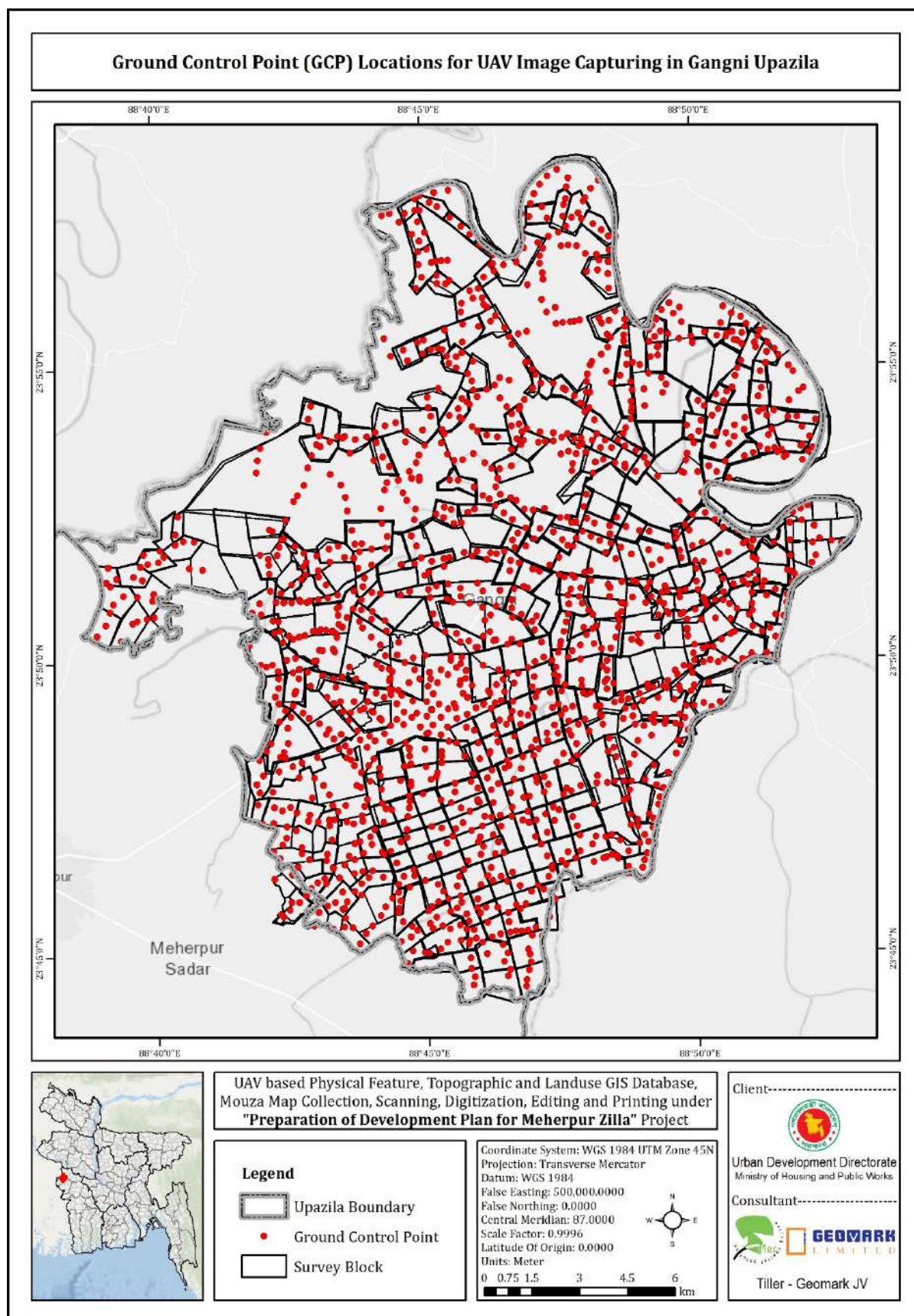
Figure 3-4: GCP Marking on Ground As per GCP Plan Before Drone Survey



Map 3-4: Ground Control Point (GCP) Locations for UAV Image Capturing in Meherpur Sadar Upazila



Map 3-5: Ground Control Point (GCP) Locations for UAV Image Capturing in Mujibnagar Upazila



Map 3-6: Ground Control Point (GCP) Locations for UAV Image Capturing in Gangni Upazila

3.2.2.3 GCP Value Establishment

Our dedicated RTK-GPS survey team had undertaken a rigorous on-site visit to each selected and marked Ground Control Point (GCP). Employing state-of-the-art high-precision surveying equipment, including **RTK-GPS and Total Stations**, they were meticulously observed the precise ground coordinates of each GCP.

This comprehensive data collection had encompasses latitude, longitude, and elevation measurements, ensuring the utmost accuracy in establishing the geospatial reference framework. At last, all the maps will be prepared showing the GCP points for Meherpur District. In the below GCPs value establishment illustration and tables containing all the value (X, Y, Z) are given-



Figure 3-5: GCP Value Collection for UAV Image Capturing

Table 3-4: GCPs Value (X, Y, Z) of Meherpur Upazila

ID	X	Y	Z
GCP-167	674849.54	2628977.65	12.5
GCP-169	675693.48	2629084.01	14.1
GCP-171	676914.90	2629038.89	11.7
GCP-173	677821.10	2629060.92	12.2
GCP-174	677786.74	2627642.15	14.2
GCP-176	678975.45	2627446.58	10.4
GCP-178	679944.26	2627465.80	10.7
GCP-180	680815.87	2627524.15	10.8
GCP-209	673529.56	2632006.05	13.1
GCP-211	674606.22	2632027.05	13.6
GCP-212	674542.18	2630612.38	13.4
GCP-213	675774.81	2632045.55	12.0
GCP-214	675626.42	2630435.72	13.0



ID	X	Y	Z
GCP-252	672604.29	2633687.67	12.8
GCP-254	673610.61	2633813.44	11.9
GCP-291	668255.17	2638100.52	11.7
GCP-293	669226.26	2638146.57	13.3
GCP-301	673448.31	2638128.06	14.3
GCP-302	673505.53	2636697.73	12.9
GCP-338	670132.33	2639034.28	14.3
GCP-339	671378.39	2639178.89	12.3
GCP-340	672495.72	2639081.59	12.3
GCP-BK-16	676941.73	2630796.51	13.0
GCP-BK-169	675693.40	2629084.13	13.9
GCP-BK-171	676922.27	2629056.02	11.6
GCP-BK-173	677801.78	2628946.33	12.2
GCP-BK-213	675741.98	2631996.36	12.0
GCP-BK-214	675626.41	2630435.76	13.0
GCP-BK-215	676514.36	2631960.84	13.2
GCP-BK-217	677894.40	2632097.25	10.5
GCP-BK-218	677875.37	2630317.40	12.1
GCP-038	667000.67	2619919.63	22.7
GCP-040	668084.41	2619849.28	24.4
GCP-042	669263.63	2619872.45	25.4
GCP-051	673641.47	2619801.43	6.4
GCP-053	674481.26	2619861.02	8.9
GCP-055	674213.41	2619199.55	9.7
GCP-056	675627.21	2619908.45	7.4
GCP-073	667101.71	2622931.64	13.3
GCP-074	667006.51	2621780.12	25.1
GCP-075	668221.08	2622984.73	14.5
GCP-076	668227.15	2621494.41	25.1
GCP-077	669292.18	2623051.12	11.7
GCP-078	669216.68	2621276.97	25.0
GCP-079	670303.52	2622865.66	11.7
GCP-081	671366.31	2622938.98	12.0
GCP-083	672616.91	2622879.96	12.9
GCP-085	673543.33	2623005.76	11.7
GCP-086	673523.92	2621084.88	13.7
GCP-087	674589.40	2622846.42	10.6
GCP-088	674675.16	2620849.66	9.2
GCP-089	675614.36	2623074.79	11.6
GCP-090	675688.15	2621490.02	11.2
GCP-091	676882.63	2622878.52	10.4



ID	X	Y	Z
GCP-092	676699.31	2621139.90	12.5
GCP-093	677732.90	2622959.44	9.7
GCP-095	678982.77	2622982.12	9.4
GCP-098	679992.28	2622942.45	9.2
GCP-101	681065.41	2622987.65	11.3
GCP-107	662714.16	2626014.09	12.9
GCP-109	663883.19	2626038.32	10.9
GCP-111	664724.98	2626060.74	15.0
GCP-113	665769.34	2625912.61	15.3
GCP-114	666166.27	2624558.09	14.2
GCP-115	667024.08	2625986.16	12.4
GCP-116	666984.79	2624787.47	14.5
GCP-117	667936.74	2625931.27	10.6
GCP-118	667941.55	2624608.64	11.4
GCP-119	669285.34	2626064.64	14.1
GCP-120	669179.29	2624668.12	13.1
GCP-121	670371.74	2626006.43	12.1
GCP-122	670553.39	2624690.66	11.5
GCP-123	671409.76	2625958.66	10.3
GCP-124	671223.55	2624542.12	12.8
GCP-125	672411.04	2625997.10	11.7
GCP-126	672333.39	2624359.38	11.7
GCP-127	673474.79	2626060.45	11.1
GCP-128	673481.78	2624429.15	10.7
GCP-129	674600.19	2625916.17	13.2
GCP-130	674700.98	2624516.97	11.9
GCP-131	675588.50	2626143.67	11.3
GCP-132	675663.67	2624668.00	11.3
GCP-133	676902.00	2625930.63	13.4
GCP-134	676935.96	2624583.57	13.4
GCP-135	677773.11	2625987.47	11.7
GCP-136	677878.62	2624256.35	12.6
GCP-137	678799.31	2625842.46	12.1
GCP-138	679009.97	2624555.48	13.4
GCP-139	679906.20	2625905.71	11.9
GCP-140	680019.27	2624422.61	12.3
GCP-141	681227.53	2625965.75	11.8
GCP-142	681055.53	2624493.65	10.5
GCP-145	662789.70	2629147.33	14.5
GCP-146	662784.63	2627538.37	14.3
GCP-147	663719.72	2629139.04	14.9



ID	X	Y	Z
GCP-148	663644.08	2627511.28	14.7
GCP-149	664903.23	2629074.77	12.4
GCP-150	664848.82	2627454.37	14.5
GCP-151	665968.04	2629026.54	8.5
GCP-152	666176.23	2627616.69	14.4
GCP-153	666960.29	2629150.59	14.3
GCP-154	666939.37	2627774.88	14.4
GCP-155	667959.89	2628947.12	12.7
GCP-156	668171.81	2627412.26	12.8
GCP-157	669214.30	2629023.51	12.6
GCP-158	669182.68	2627380.42	9.6
GCP-159	670372.36	2629088.31	12.5
GCP-160	670182.75	2627583.81	12.6
GCP-161	671468.56	2629187.65	13.3
GCP-162	671391.45	2627444.92	13.7
GCP-163	672491.54	2629017.97	11.7
GCP-164	672451.97	2627356.40	13.3
GCP-165	673499.75	2629042.45	11.5
GCP-166	673471.74	2627512.12	11.9
GCP-168	674637.26	2627721.21	12.8
GCP-170	675623.52	2627649.31	11.4
GCP-172	676775.38	2627640.88	13.1
GCP-189	662657.92	2632059.91	15.4
GCP-190	662725.19	2630618.67	12.5
GCP-191	664160.14	2632161.65	15.5
GCP-192	663861.65	2630639.51	14.4
GCP-193	664983.79	2632156.04	14.7
GCP-194	664927.01	2630720.96	15.0
GCP-195	666196.65	2632034.58	14.5
GCP-196	666084.01	2630541.71	14.8
GCP-197	667096.46	2632043.05	13.1
GCP-198	666963.47	2630519.36	14.2
GCP-199	668084.25	2632052.54	12.0
GCP-200	668045.66	2630643.20	13.7
GCP-201	669127.51	2632120.83	11.4
GCP-202	669200.89	2630393.60	11.8
GCP-203	670315.24	2631953.77	12.7
GCP-204	670170.98	2630574.18	13.1
GCP-205	671193.23	2632229.67	13.1
GCP-206	671306.78	2630665.41	10.8
GCP-207	672376.21	2632076.82	13.5



ID	X	Y	Z
GCP-208	672531.52	2630631.80	13.8
GCP-210	673494.56	2630651.03	13.6
GCP-237	664794.00	2635087.78	13.7
GCP-238	664854.08	2633785.49	15.4
GCP-239	666101.46	2635109.49	14.2
GCP-240	666030.57	2633648.43	14.3
GCP-241	667030.84	2635054.66	12.9
GCP-242	667083.20	2633672.32	13.4
GCP-243	668100.61	2635172.21	13.9
GCP-244	668186.06	2633598.10	11.9
GCP-245	669320.24	2634974.78	14.4
GCP-246	669142.06	2633587.60	14.7
GCP-247	670232.62	2635078.99	13.0
GCP-248	670332.99	2633696.68	14.6
GCP-249	671297.80	2635034.97	13.0
GCP-250	671223.74	2633401.07	13.5
GCP-251	672487.31	2635258.72	12.7
GCP-285	664839.31	2638144.69	13.8
GCP-286	664921.58	2636512.94	14.7
GCP-287	666059.66	2638152.31	13.3
GCP-288	666158.87	2636688.04	14.4
GCP-289	666990.73	2638113.48	13.1
GCP-290	666980.89	2636596.37	11.5
GCP-292	668135.22	2636687.98	9.8
GCP-294	669194.28	2636780.26	13.2
GCP-295	670410.73	2638144.44	12.5
GCP-296	670526.87	2636774.08	13.2
GCP-297	671329.73	2638211.22	13.0
GCP-298	671388.79	2636630.15	13.4
GCP-299	672444.08	2638217.14	12.4
GCP-300	672328.53	2636562.09	13.4
GCP-337	670733.99	2638867.42	14.3
GCP-341	671716.96	2638642.24	14.1
GCP-421	664472.04	2632804.38	16.3
GCP-422	664384.18	2634606.69	12.8
GCP-423	664004.47	2635098.02	12.7
GCP-424	663895.12	2633652.91	14.5
GCP-AB-51	673644.26	2619790.77	7.2
GCP-AB-53	674478.77	2619864.08	11.3
GCP-AB-56	675624.66	2619911.53	9.9
GCP-AB-85	673543.38	2623005.93	11.4



ID	X	Y	Z
GCP-AB-86	673523.87	2621084.78	13.3
GCP-AB-87	674587.48	2622841.48	10.4
GCP-AB-88	674672.65	2620852.78	11.7
GCP-AB-89	675614.37	2623075.02	11.3
GCP-AB-90	675685.64	2621493.10	13.7
GCP-Y-38	666995.87	2619923.18	11.4
GCP-Y-40	668079.38	2619852.83	12.4
GCP-Y-42	669258.60	2619875.92	13.4
GCP-Y-73	667101.61	2622931.74	13.1
GCP-Y-74	667001.47	2621783.66	13.0
GCP-Y-75	668218.22	2622987.97	14.9
GCP-Y-76	668222.10	2621497.93	13.0
GCP-Y-77	669292.08	2623051.20	11.4
GCP-Y-78	669211.65	2621280.47	12.9
GCP-Z-76	670311.98	2622905.43	11.1
GCP-Z-81	671366.24	2622939.00	11.8

Table 3-5: GCPs Value (X, Y, Z) of Mujibnagar Upazila

ID	X	Y	Z
GCP-001	664773.05	2616888.96	12.0
GCP-002	664797.30	2615251.23	12.6
GCP-003	664929.99	2613886.51	11.5
GCP-004	665529.52	2616912.48	14.9
GCP-005	665951.59	2615189.08	13.0
GCP-006	666103.93	2613861.47	12.6
GCP-007	666876.38	2613978.85	12.7
GCP-008	666900.69	2615553.07	12.2
GCP-009	666900.11	2616823.95	14.1
GCP-010	667859.36	2616953.12	12.7
GCP-011	668367.35	2615501.06	12.3
GCP-012	668043.01	2613871.96	11.2
GCP-013	669234.41	2616811.79	14.2
GCP-014	669036.79	2615635.72	12.9
GCP-015	668856.00	2613866.34	12.4
GCP-016	670188.13	2616833.38	14.2
GCP-017	670369.65	2615568.30	14.2
GCP-018	669791.85	2615847.95	14.0
GCP-019	671410.94	2617001.24	13.5
GCP-020	671686.60	2615571.20	12.2
GCP-021	670766.79	2616041.36	13.5
GCP-022	672412.61	2616874.11	9.5



ID	X	Y	Z
GCP-025	673326.41	2616950.48	11.4
GCP-028	662749.11	2619946.39	9.9
GCP-029	662734.86	2618298.56	10.1
GCP-030	662795.72	2616778.55	12.2
GCP-031	663708.35	2619883.00	12.6
GCP-032	663621.31	2618367.69	12.7
GCP-033	663677.23	2616861.24	10.8
GCP-034	664817.17	2619962.07	12.9
GCP-035	664838.65	2618315.08	13.4
GCP-036	665925.82	2619860.71	12.0
GCP-037	666035.72	2618416.16	11.0
GCP-039	667045.39	2618490.96	9.7
GCP-041	668063.90	2618225.47	12.1
GCP-043	669053.41	2618494.77	10.6
GCP-045	670203.85	2619833.79	2.6
GCP-046	670019.77	2618334.89	14.0
GCP-047	671349.36	2620002.38	12.8
GCP-048	671218.60	2618450.34	10.8
GCP-049	672420.73	2619888.34	10.7
GCP-050	672611.89	2618383.15	11.2
GCP-052	673539.15	2618388.05	12.3
GCP-054	674801.60	2618408.54	10.5
GCP-057	675997.43	2618384.95	10.9
GCP-058	675432.19	2618751.48	11.7
GCP-059	676824.22	2619973.76	11.7
GCP-062	677705.33	2620044.19	11.5
GCP-065	662750.82	2623014.96	13.7
GCP-066	662698.83	2621917.65	12.1
GCP-067	663756.20	2623002.38	14.4
GCP-068	663578.43	2621802.14	14.5
GCP-069	664750.50	2622918.92	13.8
GCP-070	664751.02	2621614.09	13.4
GCP-071	666069.77	2622849.55	13.6
GCP-072	665923.65	2621301.02	12.0
GCP-080	670272.39	2621458.86	1.7
GCP-082	671313.44	2621056.94	9.7
GCP-084	672437.37	2621037.60	13.4
GCP-094	677803.91	2621145.87	9.7
GCP-096	678990.38	2621634.34	12.2
GCP-099	680009.44	2621310.13	12.5
GCP-102	681174.62	2621135.92	11.9
GCP-104	682249.06	2622883.26	12.3
GCP-105	682236.68	2621108.62	10.4



ID	X	Y	Z
GCP-108	662639.17	2624600.46	12.2
GCP-110	663717.05	2624629.53	11.8
GCP-112	664776.16	2624632.46	14.8
GCP-143	681981.44	2626016.49	11.2
GCP-144	682118.31	2624454.33	11.3
GCP-182	682161.37	2627351.46	11.3
GCP-Z-45	670207.40	2619839.11	12.3
GCP-Z-47	671349.34	2620002.24	12.4
GCP-Z-80	670275.91	2621464.16	11.3
GCP-Z-82	671305.60	2621042.12	9.6

Table 3-6: GCPs Value (X, Y, Z) of Gangni Upazila

ID	X	Y	Z
BM_5686_Check point	2631872.01	675223.22	13.6
BM_5686_Check point_1	2631872.23	675223.65	13.5
TBM-1	2635348.96	678433.65	13.7
TBM-2	2635345.81	678432.02	13.5
GCP-1	2635135.16	678279.54	13.5
GCP-2	2635522.84	678664.67	11.6
GCP-3	2635848.27	678491.38	13.1
GCP-4	2636448.37	678943.63	12.7
GCP-5	2636079.96	678325.34	12.1
GCP-6	2636196.69	678620.86	13.8
GCP-7	2636308.40	678399.17	12.8
GCP-7	2636518.66	678371.52	12.6
GCP-8	2636596.36	678731.64	12.4
GCP-9EP	2635590.21	678281.74	12.8
GCP-10	2635370.50	678960.39	12.8
GCP-11	2635528.51	679130.67	12.2
GCP-12	2635854.95	679422.90	12.7
GCP-13	2636131.28	679332.60	13.2
GCP-14	2636250.72	679344.01	11.7
GCP-15	2635403.65	679200.75	13.5
GCP-16	2634797.23	678080.24	11.9
GCP-17	2634581.31	678268.46	11.7
GCP-18	2634860.96	678472.64	12.4
GCP-19	2635103.68	678733.74	13.9
GCP-20	2634550.64	678726.22	12.9
GCP-21	2634025.84	678752.53	13.4
GCP-22	2634346.14	678980.22	13.0
GCP-23	2634799.51	678929.22	13.2



ID	X	Y	Z
GCP-23	2635059.30	679231.11	12.5
TBM-2 Check point	2635345.82	678432.04	13.5
GCP-24	2635226.90	677970.39	12.9
GCP-25	2635619.67	677836.43	14.7
GCP-26	2635793.78	677491.52	13.5
GCP-27	2635973.86	677198.33	13.0
GCP-28	2635822.84	677156.43	14.9
GCP-29	2635721.37	676947.15	13.4
GCP-30	2635871.38	676686.96	13.4
GCP-31	2636047.95	676376.16	13.7
GCP-32	2635597.65	676412.27	12.7
GCP-33	2635529.84	677342.79	13.5
GCP-34	2634842.52	677141.18	12.7
GCP-35	2635064.71	676807.81	13.0
GCP-36	2635294.14	676549.22	13.5
GCP-37	2635373.83	676313.70	13.0
GCP-38	2634502.76	676489.35	13.8
GCP-39	2634673.97	676089.79	14.0
GCP-40	2635005.49	675828.50	13.8
GCP-41	2635277.66	675652.80	13.2
GCP-42	2635544.20	675366.67	13.7
GCP-43	2634389.62	676185.17	13.6
GCP-44	2634203.24	675716.24	14.0
GCP-45	2634121.17	675517.07	13.9
GCP-46	2634020.63	675862.02	12.9
GCP-47-T-BW	2633823.05	675756.36	11.9
GCP-48	2633580.90	676446.61	12.8
GCP-49	2633514.02	676801.86	13.2
GCP-50	2633797.63	676615.96	13.6
GCP-51	2634159.35	676409.14	13.0
GCP-52	2634352.92	676655.33	13.6
GCP-53	2634330.02	677135.52	11.8
GCP-54	2634580.85	676951.03	12.1
GCP-55	2635032.94	677333.26	12.8
GCP-56	2635267.35	677560.99	12.9
GCP-57	2635100.52	677823.21	13.2
GCP-58	2634875.17	677552.09	13.0
GCP-59	2634294.47	677609.63	13.3
GCP-60	2634136.26	677734.91	13.1
TBM-2 Check point	2635345.77	678432.03	13.5
Drone-RTK Check	2636248.08	677106.41	11.9
TBM-2 Check point	2635345.81	678432.02	13.5
GCP-61	2636784.37	679355.62	11.4



ID	X	Y	Z
GCP-62	2636665.25	679218.27	11.4
GCP-63	2636574.23	679523.23	11.0
GCP-64	2636995.43	679385.37	12.0
GCP-65	2635727.27	679566.59	13.3
GCP-66	2636103.37	679705.97	11.6
GCP-67	2635403.53	679830.51	13.4
GCP-68 BW p	2635197.11	679554.69	13.0
TBM-2 Check point	2635345.77	678432.03	13.5
GCP-69	2635559.30	680432.44	13.5
GCP-70	2635380.54	680298.21	11.5
GCP-71	2635544.33	680072.58	11.2
GCP-72 coner	2635899.33	680723.57	11.9
GCP-73	2636125.33	680474.22	11.2
GCP-74	2636295.66	680683.20	11.6
GCP-75	2635934.29	680229.62	11.5
GCP-76	2634612.99	678328.14	12.9
GPS-5586	2631871.39	675223.61	13.5
BM-2	2632496.21	679879.25	13.2
GCP-77	2631962.32	680325.36	12.1
GCP-78 EP+B	2632019.12	680592.50	13.1
GCP-79	2631989.61	680957.29	12.5
GCP-80	2631672.28	680625.34	13.7
GCP-81	2632870.31	679888.69	13.7
GCP-82 BW	2632427.79	679913.40	12.4
GCP-83	2632139.80	679641.80	12.2
GCP-84	2632247.71	679359.54	13.0
GCP-85	2632415.57	679050.71	12.2
GCP-86-EP	2632499.14	678726.78	12.0
GCP-87-Tre	2633034.10	679173.88	12.2
GCP-88-BW	2632752.53	679173.94	12.4
GCP-89	2631682.52	680038.73	12.7
GCP-90	2631538.50	679696.44	13.1
GCP-91	2631590.32	679192.43	10.2
GCP-92	2631367.52	679097.96	12.0
GCP-93Tre	2631788.13	679416.93	11.3
GCP-94	2631335.01	679961.52	8.9
GCP-94	2631333.78	679962.36	11.8
GCP-95	2630579.85	679575.25	11.5
GCP-96	2631182.27	679912.16	11.5
GCP-97	2630792.89	679990.58	10.6
GCP-98	2631035.58	680065.65	14.6
GCP-99	2631403.00	680369.73	8.2
GCP-100	2631984.77	680101.68	12.5



ID	X	Y	Z
GCP-101	2632415.16	680384.51	12.9
GCP-102	2632820.04	680308.92	13.1
GCP-103	2633195.50	680187.55	12.4
GCP-104 EP	2633433.31	680335.12	15.9
GCP-105	2633596.74	680876.07	12.8
GCP-106	2633506.23	680742.52	11.7
GCP-107	2633016.82	680536.75	12.7
GCP-108	2630815.99	680446.61	13.7
GCP-109	2631185.60	680540.49	13.5
GCP-110	2631185.70	680540.27	13.1
GCP-111	2631862.05	681300.23	12.2
TBM-@@@	2632433.05	679920.56	12.8
TBM-@@ chak	2632432.97	679920.43	12.8
GCP-112 EP	2633072.81	679674.14	12.2
GCP-113	2633327.90	679729.80	13.7
GCP-114	2633875.88	679468.98	13.5
GCP-115	2634304.23	679223.81	13.0
GCP-116	2633866.18	678754.53	13.3
GCP-117 pam	2633673.44	678752.87	13.1
GCP-118	2633353.51	678625.27	12.9
GCP-119 pam	2633232.91	678578.50	12.3
GCP-120 pam	2633149.51	678413.37	11.4
GCP-121Ep	2632689.62	678169.80	10.5
GCP-122	2634109.73	677738.49	13.5
GCP-123	2633878.60	677741.74	12.9
GCP-124	2633632.06	677782.21	12.7
GCP-124 Field	2633550.07	677567.29	11.4
GCP-125 Field	2633554.96	677587.50	11.2
GCP-126 EP	2633116.63	677459.79	10.4
GCP-127	2633059.90	677777.04	12.1
GCP-128	2633254.92	676827.05	13.5
GCP-129	2632839.52	676856.54	13.1
GCP-130	2632398.72	676888.66	13.5
GCP-131	2634110.27	678228.00	12.0
GCP-132	2633546.37	678263.59	11.3
TBM-@@ chak	2632432.83	679920.53	12.8
GCP-133	2632138.81	681464.32	13.5
GCP-134	2632621.36	681510.11	13.5
GCP-135	2633064.99	681740.77	13.8
GCP-136	2633217.84	681706.81	12.0
GCP-137 Ep	2633230.90	681976.99	14.2
GCP-138	2633690.82	682366.85	13.7
GCP-139	2633960.12	682582.10	13.8



ID	X	Y	Z
GCP-140	2634271.27	682997.16	13.3
GCP-141	2634540.55	682827.02	12.4
GCP-142 Ep	2634613.46	682404.49	12.7
GCP-143 Solar	2634369.43	682079.03	12.2
GCP-144 Pamp	2634121.92	681806.70	12.4
GCP-145 Pamp	2633906.04	681648.16	11.8
GCP-146 Pamp	2633478.37	681253.32	12.4
GCP-147 Pamp	2633158.77	681026.67	11.9
GCP-148	2632731.61	680925.95	12.1
GCP-149 Pamp	2632272.06	680972.58	12.9
GCP-150	2631793.54	681502.57	12.6
GCP-150 TBM	2631792.84	681500.70	12.7
GCP-152	2631865.45	681727.46	13.6
GCP-153	2632061.24	682025.92	13.0
GCP-154 BW	2632289.05	682261.05	12.6
GCP-155	2632185.77	682436.60	13.1
GCP-156	2631973.93	682870.20	13.8
GCP-157	2631684.37	683017.60	15.0
GCP-158 BW	2631404.08	683104.68	14.1
GCP-159	2631118.10	683492.03	12.5
GCP-150 check	2631793.55	681502.58	12.5
GCP-160	2631485.95	682066.88	12.5
GCP-161	2631858.00	682296.19	11.5
GCP-162	2632579.85	681341.79	11.5
GCP-163	2632754.41	681977.77	12.1
GCP-164	2632988.42	682107.30	12.2
TBM-@@ chak	2632433.18	679920.56	12.8
GCP-165	2631356.16	681703.86	13.0
GCP-166	2631116.03	681883.15	11.4
GCP-167	2630747.16	682075.80	13.4
GCP-168	2630338.27	682233.58	13.0
GCP-169	2630602.42	682525.17	11.4
GCP-170	2630473.36	682674.72	11.9
GCP-171	2630868.13	682722.98	12.0
GCP-172	2630686.56	682967.70	11.5
GCP-173 EP	2630897.35	683113.87	12.9
GCP-174	2631369.11	683608.29	12.5
GCP-175	2631349.37	683919.22	12.6
GCP-176	2631238.41	684371.07	12.6
GCP-177	2630896.17	684634.98	13.0
GCP-178 Pamp	2630791.47	684119.47	12.3
GCP-179	2630702.77	683943.27	11.5
GCP-180 pamp	2630664.00	684304.26	10.7



ID	X	Y	Z
GCP-181	2630422.67	684638.19	12.8
GCP-182	2630199.66	684598.28	12.6
GCP-183	2632684.33	682585.37	11.2
GCP-184	2632876.12	682683.49	11.0
GCP-185 Pamp	2632952.08	683118.21	12.1
GCP-186 Pamp	2632792.10	682828.61	11.8
TBM-2 Check point	2635345.58	678432.03	13.3
GCP-187	2635607.40	680991.22	12.4
GCP-188 BW	2635289.02	680966.49	12.6
GCP-189	2635067.63	680922.54	13.9
GCP-190 BW	2634881.60	680785.02	11.8
GCP-191 Pamp	2635016.57	680574.75	12.0
GCP-192 Pamp	2634840.30	680376.21	11.9
GCP-193 Ep	2634585.14	680479.54	11.9
GCP-194	2634338.78	680523.89	12.6
GCP-195	2634876.71	681231.31	12.2
GCP-196 Ep	2634504.96	681040.27	11.9
GCP-197	2634043.43	680895.29	12.2
GCP-198	2633746.16	680810.52	11.7
GCP-199 Pamp	2633872.17	681306.44	12.0
GCP-200 Pamp	2634150.33	681578.91	11.8
GCP-201Pamp	2634389.60	681710.32	11.2
GCP-202 Pamp	2634609.90	682062.37	11.8
GCP-203	2634865.37	682297.95	11.6
GCP-204	2635180.71	682507.13	11.7
GCP-205	2635411.10	682234.65	11.1
GCP-206	2635521.27	682419.70	11.3
GCP-207	2635926.38	682524.79	12.6
GCP-208	2635891.78	682167.70	13.4
GCP-209	2635753.13	681716.31	11.3
GCP-210	2635371.14	681611.35	10.2
GCP-211	2635177.17	681467.79	10.1
GCP-212	2635218.25	681232.48	12.3
GCP-213	2634791.49	679532.67	12.6
GCP-214 Ep	2634694.18	679777.10	12.2
GCP-215 Ep	2634293.78	679896.99	11.8
GCP-216	2633796.26	679953.38	13.0
TBM-2Check	2635345.55	678432.03	13.4
GCP-217 Pamp	2632222.74	677003.28	11.2
GCP-218 Pamp	2632193.56	677183.99	9.4
GCP-219	2631792.10	676930.46	13.0
GCP-220	2630855.79	676889.41	13.3
GCP-221 Ep	2630888.59	677152.08	12.6



ID	X	Y	Z
GCP-222	2631182.99	677474.95	11.3
GCP-223 Pamp	2631321.40	677665.40	10.0
GCP-224 Pamp	2631566.09	677658.33	9.8
GCP-225 Ep	2631978.51	677691.97	10.1
GCP-226 pam	2632251.04	677731.40	9.8
GCP-227 Pamp	2632454.29	677760.04	10.0
GCP-228 Pamp	2632636.24	677739.34	10.8
GCP-229 Ep	2632943.94	677784.24	11.2
GCP-230	2630793.25	676940.03	12.8
GCP-231	2630511.28	677343.98	12.0
GCP-232	2630091.37	677561.72	12.3
GCP-233 Pamp	2630122.94	677907.00	10.9
GCP-234	2630314.15	677873.68	11.6
GCP-235 BW	2630707.86	678422.33	11.8
GCP-236 BW	2630803.13	678666.90	12.5
GCP-237-EP	2631153.81	678916.11	12.5
GCP-238	2631612.61	678748.51	11.6
GCP-239 Pamp	2631660.03	678443.02	11.4
GCP-240	2633962.77	680253.43	12.8
GCP-241	2634022.47	680268.75	12.4
BM_5686_Check point	2631871.74	675223.56	14.1
GCP-242 BW	2630822.45	676280.77	13.1
GCP-242 BW	2630822.45	676280.77	13.1
GCP-243 Ep	2631095.93	676560.37	13.3
GCP-244 Ep	2631186.10	676185.05	12.8
GCP-245 Ep	2631566.22	676640.04	13.5
GCP-246 school	2631342.83	676514.46	13.1
GCP-247 Ep	2630075.36	676924.20	13.8
GCP-248 BW	2630060.89	676461.03	13.1
GCP-249 BW	2629161.17	675170.66	12.3
GCP-250 Ep	2629264.53	675409.31	13.1
GCP-251 Ep	2629600.97	675643.69	13.0
GCP-252 p	2629062.30	675646.11	13.9
GCP-253	2629084.11	675693.38	13.8
GCP-254 Ep	2629286.30	675781.28	12.5
TBM-1 chak	2635348.86	678433.73	13.5
GCP-255 p	2636900.32	679038.89	13.3
BM-11	2637028.52	679040.75	12.5
GCP-256 pol	2637490.03	679335.71	13.1
GCP-257-Ep	2637505.97	679602.19	12.8
GCP-258 BW	2637301.75	679876.06	12.5
GCP-259	2637737.90	679220.40	12.7
GCP-260 -p	2637792.54	678860.31	13.6



ID	X	Y	Z
GCP-261 -p	2638022.67	678588.63	13.3
GCP-262	2638360.98	678473.23	13.5
GCP-263-pamp	2638876.20	678376.42	12.6
GCP-264-Ep	2638824.90	678924.54	12.3
GCP-265 BW	2639123.47	678333.84	15.5
GCP-266 BW	2639233.47	678581.82	13.7
GCP-267 BW	2639071.14	677749.80	13.8
GCP-268	2638950.50	677461.50	13.3
GCP-269 -Bw	2639573.65	678212.52	12.9
GCP-270 -Bw	2640130.13	678990.41	13.4
GCP-271 -pol	2640094.82	678821.07	13.6
GCP-272-Ep	2640015.16	678444.57	13.3
TBM-2 chak	2635345.76	678432.03	13.5
BM-4	2635876.46	683208.49	12.6
GCP-273	2635835.47	683303.78	12.6
GCP-274-BW	2635454.74	683612.07	14.2
GCP-275	2635211.87	683740.70	11.8
GCP-276 BW	2635042.28	683260.79	12.4
GCP-277 BW	2635449.04	682872.13	12.2
GCP-278 -EP	2635363.47	682633.08	12.5
GCP-279	2634993.86	682758.49	11.1
GCP-280 BW	2634887.36	683054.14	13.5
GCP-281 BW	2634680.12	682753.84	12.8
GCP-282 -BW	2634879.91	683822.65	13.1
TBM-1 chak	2635348.78	678433.67	13.5
BM-02	2632496.33	679879.14	13.2
GCP-283 -BW	2630309.05	679443.83	12.6
GCP-284	2630094.95	679320.28	13.2
GCP-285-P	2629800.04	679249.13	11.2
GCP-286 -BW	2629145.85	678453.75	12.4
GCP-287-BW	2629293.28	678660.44	12.6
GCP-288	2629626.89	678810.79	13.0
GCP-289	2629838.78	678644.57	10.6
GCP-290	2629967.34	678239.29	12.6
GCP-291	2629838.89	677395.87	12.7
GCP-292	2629587.70	677395.66	13.0
GCP-293	2629324.01	677473.15	12.7
GCP-294	2629088.78	677407.13	13.2
GCP-295	2628522.94	677832.95	11.6
GCP-296	2628045.73	677480.58	13.4
GCP-297	2628188.02	677788.69	13.2
GCP-298	2628392.90	677998.50	14.2
GCP-299	2627364.95	677685.27	13.3



ID	X	Y	Z
GCP-300	2627750.51	677850.28	13.4
GCP-301	2627673.07	678365.74	11.5
GCP-302	2628081.17	679634.31	13.3
GCP-303	2628142.58	679837.65	12.9
GCP-304	2628416.82	679769.64	12.4
GCP-305	2628676.23	679610.35	12.7
GCP-306	2628909.20	679541.83	13.2
GCP-307	2629104.34	679243.37	12.7
GCP-308	2629285.12	679386.19	14.7
GCP-309	2629481.82	679346.55	12.6
GCP-310	2629110.85	679880.08	13.5
GCP-311	2628940.31	679979.20	12.1
GCP-312	2628662.71	680199.80	13.5
GCP-313	2628183.94	680340.30	12.1
GCP-314	2628285.33	680607.32	12.8
GCP-315	2628381.44	681084.55	12.9
GCP-316	2628410.78	681467.73	12.4
GCP-317	2628384.56	681268.15	12.5
GCP-318	2628330.39	680908.40	12.8
GCP-319	2628668.47	680867.27	11.3
GCP-320	2628962.46	680846.82	11.8
GCP-321	2629122.97	680146.62	11.7
GCP-322	2629119.22	680514.20	13.3
GCP-323	2629210.39	681096.15	12.2
GCP-324	2629383.20	679888.45	12.2
GCP-325	2629833.00	679986.88	12.3
GCP-326	2630120.33	680206.56	13.5
GCP-327	2630373.03	680303.86	13.6
BM-5588-Cheak	2643139.64	683575.50	14.0
BM-10	2638319.12	684286.87	12.9
TBM-09 Word	2638154.34	684331.68	12.8
TBM-09 Word 2	2638152.80	684331.63	12.8
GCP-328	2636990.64	688649.90	14.1
GCP-329	2636908.01	688346.53	14.1
GCP-330	2637143.55	688972.88	14.1
GCP-331	2637034.20	689216.16	13.6
GCP-332	2637648.10	689255.00	13.6
GCP-333	2637818.56	688838.87	14.3
GCP-334	2637983.03	688540.48	14.4
GCP-335	2638351.41	688414.41	14.6
GCP-336	2639222.93	688826.60	14.6
GCP-337	2639036.23	688515.39	13.7
GCP-338	2637928.37	689079.70	13.9



ID	X	Y	Z
GCP-339	2639138.17	689248.35	14.7
GCP-340	2638736.16	689604.89	12.8
GCP-341	2638987.84	689620.99	14.9
GCP-342	2638313.99	689510.93	13.9
GCP-343	2636777.74	688184.10	12.6
TBM-09 Word 2 chaek	2638152.80	684331.67	12.7
GCP-344	2638910.31	685335.81	13.7
GCP-345	2639362.31	685288.68	13.3
GCP-346	2639361.98	684878.20	13.5
GCP-347	2639178.57	685206.55	13.8
GCP-348	2638757.74	685589.62	13.6
GCP-349	2638368.39	685890.16	13.2
GCP-350	2638363.93	686266.64	13.9
GCP-351	2638191.69	686468.10	14.2
GCP-352	2638498.69	686724.75	13.8
GCP-353	2638317.52	685565.57	13.1
GCP-354	2638649.32	687092.67	14.6
GCP-355	2638807.02	687354.96	14.6
GCP-356	2639048.72	687620.72	14.4
GCP-357	2639472.87	687599.21	13.7
GCP-358	2639287.69	687921.10	14.7
GCP-359	2639409.45	688227.73	14.4
GCP-360	2639442.56	688629.67	14.9
GCP-361	2639708.72	688679.50	14.1
GCP-362 -BW	2640450.71	688472.81	14.1
GCP-363 -BW	2640663.27	688333.28	13.5
GCP-364	2640980.89	688060.48	14.4
GCP-365	2639371.03	689760.45	14.7
GCP-366	2639701.20	689751.08	14.6
GCP-367	2640203.29	689713.09	14.4
GCP-368	2640612.43	689202.66	14.6
GCP-369	2640691.96	689696.12	14.4
GCP-370	2641242.88	689704.36	14.5
TBM-09 Word 2 chaek	2638152.82	684331.69	12.7
GCP-371	2637934.46	684309.74	13.1
GCP-372	2637634.06	684222.90	12.3
GCP-373	2637276.45	684076.19	12.7
GCP-374	2636897.16	683946.03	13.5
GCP-375	2636580.92	683947.97	13.6
GCP-376	2636306.04	683944.56	13.5
GCP-377	2635994.07	683952.44	12.1
GCP-378	2635892.05	683439.22	12.1
GCP-379	2636395.84	682413.26	13.0



ID	X	Y	Z
GCP-380	2636687.52	682350.75	11.7
GCP-381	2637143.56	682420.11	12.5
GCP-382	2637201.27	682857.87	12.5
GCP-383	2637373.33	683111.65	12.9
GCP-384	2637712.11	683309.61	13.4
GCP-385	2637974.98	683599.73	13.2
GCP-386	2638483.97	683379.83	13.3
GCP-387	2638697.84	683176.88	13.2
GCP-388	2638905.97	683077.15	13.3
GCP-389	2638668.42	682753.66	13.5
GCP-390	2638354.85	682731.41	13.8
GCP-391	2638103.28	682663.65	13.3
GCP-392	2637808.84	682599.15	13.1
GCP-393	2637491.58	682495.41	13.2
GCP-394	2637348.28	682476.23	13.2
GCP-395	2638950.34	682729.29	13.5
GCP-396	2639140.49	682810.35	13.8
GCP-397	2639175.03	683119.01	13.8
GCP-398	2639496.95	682937.44	14.2
GCP-399	2639518.22	682606.51	13.4
GCP-400	2639697.04	681826.40	12.1
GCP-401	2639770.14	681614.87	11.9
GCP-402	2639958.63	681182.88	13.4
GCP-403	2640039.57	680924.60	13.0
GCP-404	2639710.53	680896.40	13.5
TBM-09 Word 2 chack	2638152.80	684331.65	12.7
GCP-405	2639085.90	685844.93	11.7
GCP-406	2639077.91	686224.98	12.7
GCP-407	2639124.78	686413.19	12.8
GCP-408	2639124.72	686807.62	12.8
GCP-409	2639145.44	681022.27	11.6
GCP-410	2639216.92	681328.68	13.1
GCP-411	2639171.05	681464.54	11.9
GCP-412	2638801.97	680953.67	12.7
GCP-413	2638537.18	680954.79	11.6
GCP-414	2638338.44	681257.55	12.1
GCP-415	2637861.73	681672.51	12.2
GCP-416	2638116.30	681586.56	13.1
GCP-417	2638286.35	681732.30	13.3
GCP-418	2640340.16	680713.47	13.0
GCP-419	2640254.01	680475.53	13.7
GCP-420	2640336.44	679871.86	12.5
GCP-421	2640277.53	680288.76	12.1



ID	X	Y	Z
GCP-422	2640447.10	681051.73	13.1
GCP-423	2640683.49	680975.38	13.9
GCP-424	2640895.10	681153.50	13.1
TBM-09 Word 2 chack	2638152.79	684331.62	12.7
GCP-425	2639394.88	686759.86	13.7
GCP-426	2639791.41	686769.45	13.7
GCP-427	2640128.24	686289.03	13.4
GCP-428	2640362.19	686241.26	13.3
GCP-429	2640754.05	686122.99	13.9
GCP-430	2640929.17	686118.66	13.0
GCP-431	2641168.05	686406.02	13.7
GCP-432	2641492.46	686631.64	14.1
GCP-433	2641539.65	687035.71	13.7
GCP-434	2641324.09	687339.07	13.5
GCP-435	2640952.62	685280.25	12.7
GCP-436	2640986.44	684971.29	11.9
GCP-437	2641105.02	684547.59	13.1
GCP-438	2641401.37	684266.22	12.8
GCP-439	2641141.47	684035.58	13.5
GCP-440	2641221.63	683561.16	13.7
GCP-441	2641370.78	683320.69	14.0
GCP-442	2640961.68	683178.97	13.0
GCP-443	2640799.83	683449.75	13.7
GCP-444	2640676.59	683721.29	12.7
GCP-445	2640875.40	684046.23	13.3
GCP-446	2640581.70	684067.67	13.0
GCP-447	2640738.80	682984.32	12.7
GCP-448	2640514.19	682716.01	12.9
GCP-449	2640692.73	682555.00	12.6
GCP-450	2640942.46	682259.11	14.0
GPS 5588 check	2643140.32	683575.51	13.9
GCP-451	2643119.59	684201.99	14.7
GCP-452	2642972.06	684524.18	14.3
GCP-453	2642851.93	684852.54	15.0
GCP-454	2643088.23	685225.49	14.3
GCP-455	2643286.93	685124.41	15.5
GCP-456	2643508.28	684864.10	14.5
GCP-457	2643643.85	684516.66	14.6
GCP-458	2644030.67	684449.20	14.7
GCP-459	2643831.47	684287.59	14.6
GCP-460	2643591.12	684098.98	15.7
GCP-461	2643227.53	683826.82	15.2
GCP-462	2642793.97	683508.04	14.3



ID	X	Y	Z
GCP-463	2642123.67	683306.36	13.5
GCP-464	2641737.37	683223.61	13.5
GCP-465	2641244.89	682968.73	12.3
GCP-466	2641037.67	681841.20	13.9
GCP-467	2640727.80	681647.20	13.5
GCP-468	2641066.68	681384.78	13.7
GCP-469	2641335.05	680977.52	14.2
GCP-470	2641538.22	680701.07	12.6
GCP-471	2641755.41	680424.97	12.3
GCP-472	2641650.91	679780.33	13.3
GCP-473	2641225.39	679372.75	12.8
GCP-474	2641197.86	679132.01	13.0
GCP-475	2641494.29	678573.66	12.8
GCP-476	2641387.75	678817.27	12.4
GCP-477	2641635.82	679051.37	13.6
GCP-478	2641710.13	678834.28	12.4
GCP-479	2641561.07	679577.16	12.9
GCP-480	2642346.82	679774.84	13.6
GCP-481	2642565.02	679269.87	14.0
GCP-482	2642577.46	678999.90	13.2
GCP-483	2642921.69	680576.28	15.5
GCP-484	2643016.64	680938.03	14.5
GCP-485	2643691.96	681243.06	14.6
GCP-486	2643874.59	681112.54	14.2
GPS 5588 check	2643140.33	683575.49	13.9
GCP-487	2642692.61	685540.57	15.4
GCP-488	2642803.63	686370.38	14.1
BM-06	2642837.71	686800.26	13.9
GCP-489	2643022.45	687147.99	14.9
GCP-490	2642474.30	687133.08	12.1
GCP-491	2642841.26	687394.38	13.2
GCP-492	2643176.30	687662.55	12.7
GCP-493	2643329.31	688273.80	12.3
GCP-494	2643441.22	688548.10	13.1
GCP-495	2643542.54	689010.27	13.8
GCP-496	2643547.28	689437.22	12.6
GCP-497	2643665.02	690048.24	14.8
GCP-498	2643605.39	690416.94	17.0
GCP-499	2643643.16	688753.15	14.4
GCP-500	2644005.47	689023.96	14.4
GCP-501	2644197.52	689135.69	14.0
GCP-502	2644607.68	688982.93	14.2
GCP-503	2644782.82	689196.22	14.7



ID	X	Y	Z
GCP-504	2644568.11	689637.33	12.5
GCP-505	2644495.56	690496.40	13.6
GCP-506	2644586.30	689912.37	13.2
GCP-507	2644827.60	688867.43	14.8
GCP-508	2644740.93	688713.95	14.3
GCP-509	2645216.44	688701.34	14.6
GCP-510	2645490.98	688795.85	14.5
GCP-511	2646010.66	688769.46	14.9
GCP-512	2647166.92	683945.23	15.1
GCP-513	2647589.59	684011.04	15.1
GPS 5588 check	2643140.32	683575.51	13.9
GCP-514	2644727.16	684713.33	14.6
GCP-515	2645054.03	684701.56	14.8
GCP-516	2645671.22	684691.43	13.5
GCP-517	2646551.73	684599.74	11.6
GCP-518	2645863.64	684359.12	12.9
GCP-519	2646211.91	684565.34	13.3
GCP-520	2646458.71	685321.57	13.6
GCP-521	2646498.55	685544.78	12.7
GCP-522	2646761.28	685536.61	13.6
GCP-523	2646937.23	685269.08	13.0
GCP-524	2647434.73	685362.75	13.5
GCP-525	2647652.88	685492.23	13.5
GCP-526	2648149.95	685895.34	13.4
GCP-527	2647098.09	686591.40	8.5
GCP-528	2647234.32	687020.71	15.1
GCP-529	2647128.96	687398.12	13.5
GCP-530	2647099.36	687684.60	13.1
GCP-531	2646974.56	688047.68	13.7
GCP-532	2646860.62	688196.57	14.1
GCP-533	2646335.59	688162.20	12.7
GCP-534	2646905.94	688587.00	13.0
GCP-535	2647115.51	688695.35	12.8
GCP-536	2646772.05	688617.09	13.2
GCP-537	2646620.32	688970.31	12.1
GCP-538	2645361.36	687717.46	11.9
GCP-539	2645063.53	687609.92	12.7
GCP-540	2644814.90	687449.56	12.9
GCP-541	2645281.99	687377.02	12.3
GCP-542	2644914.18	687003.84	11.5
GCP-543	2645082.07	686815.64	12.8
GCP-544	2644607.35	687256.35	12.6
GCP-545	2644461.11	686914.67	13.1



ID	X	Y	Z
GCP-546	2644124.15	686831.81	13.0
GCP-547	2644304.42	686459.71	13.3
GCP-548	2643924.56	686595.25	13.3
GCP-549	2643410.33	686466.28	13.5
GCP-550	2643196.36	686427.66	12.9
GCP-551	2642852.26	686286.09	13.0
GCP-552	2643063.57	684517.76	13.4
GCP-553	2643450.27	683281.22	13.0
GCP-554	2643727.45	683169.32	12.7
GCP-555	2643887.16	683133.32	13.4
GCP-556	2643824.65	683479.08	12.8
GCP-557	2643824.26	683890.76	12.6
GCP-558	2643593.22	683752.51	14.1
GPS 5588 check	2643140.33	683575.48	13.9
MB-09	2643648.35	683067.01	14.2
GCP-559	2644029.64	683623.63	14.5
GCP-560	2644467.88	683557.55	15.1
GCP-561	2644956.58	683173.25	14.5
GCP-562	2645344.68	683302.90	14.5
GCP-563	2647513.38	683784.28	15.2
GCP-564	2647670.68	683695.45	14.8
GCP-565	2647897.13	684206.26	14.7
GCP-566	2648606.67	683994.84	15.1
GCP-567	2649071.66	683978.43	15.1
TBM 22	2649446.65	683992.45	14.4
TBM 33 P	2649447.92	683990.29	14.4
TBM 33 P- check	2649447.96	683990.31	14.3
TBM 33 P -Fix	2649448.13	683990.09	14.8
GCP-568	2649138.57	683302.92	14.8
GCP-569	2649189.69	683646.93	14.9
GCP-570	2649503.62	683700.84	14.5
GCP-571	2650256.83	683990.21	14.8
GCP-572	2650449.47	683774.77	15.0
GCP-573	2650639.20	683506.90	15.0
GCP-574	2650800.78	683135.12	14.9
GCP-575	2651352.41	683190.56	14.1
GCP-576	2650983.68	683044.57	14.3
GCP-577	2650841.80	682840.84	15.2
GCP-578	2650557.50	682661.95	13.9
GCP-579	2651431.43	682641.48	14.9
GCP-580	2651237.96	682588.09	14.7
GCP-581	2651180.22	681905.63	13.6
GCP-582	2650869.83	681495.89	14.7



ID	X	Y	Z
GCP-583	2650820.29	682057.17	14.5
GCP-584	2650873.99	682559.13	14.8
GCP-585	2650048.73	681766.66	15.1
GCP-586	2650182.42	681294.25	15.0
GCP-587	2649880.00	681326.26	14.6
GCP-588	2649422.86	681094.85	14.7
GCP-589	2649342.48	680692.14	15.2
GCP-590	2649594.46	681063.43	15.6
GCP-591	2649668.75	680363.70	13.8
GCP-592	2649938.82	680014.48	13.7
GCP-593	2649995.50	679929.17	13.6
GCP-594	2650306.64	679627.43	15.1
GCP-595	2650555.63	679356.29	13.7
GCP-596	2650839.22	679005.21	14.5
GCP-597	2651178.64	678592.29	14.7
GCP-598	2651307.97	678355.95	15.6
GCP-599	2651419.94	677883.85	15.0
GPS 5588 check	2643140.31	683575.49	13.8
GCP-600	2643756.38	681792.22	14.1
TBM_DZMC	2643815.18	681315.48	13.4
TBM_DZMC_2	2643816.13	681310.87	13.5
GCP-601	2643931.03	680504.87	14.2
GCP-602	2643986.13	680160.28	14.2
GCP-603	2644112.09	679874.03	12.1
GCP-604	2644540.41	679312.83	13.2
GCP-605	2644594.12	678985.83	13.6
GCP-606	2644154.08	678764.22	13.4
GCP-607	2644572.29	678399.76	14.6
TBM_Karmde School	2644853.10	678321.63	14.7
TBM_Karmde School_2	2644854.81	678318.59	14.9
GCP-608	2645170.07	678292.92	13.8
GCP-609	2644371.46	677302.69	14.4
GCP-610	2644279.85	676963.63	14.4
GCP-611	2644061.40	676651.69	15.5
TBM_Karmde School_2 Cheak	2644854.84	678318.58	14.9
GCP-612	2644143.19	678154.62	13.2
GCP-613	2643934.25	676390.67	15.2
GCP-614	2643848.26	676033.92	14.5
GCP-615	2643935.68	675696.85	15.1
5584 GPS	2644073.94	673227.91	13.2
GCP-616	2644480.22	674552.18	14.9
GCP-617	2644887.17	674627.12	15.5
GCP-618	2643954.63	674899.39	13.7



ID	X	Y	Z
GCP-619	2643673.43	674808.70	13.9
GCP-620	2643334.26	674659.71	11.5
GCP-621	2643614.82	674926.91	13.8
GCP-622	2643781.91	675230.39	14.1
GCP-623	2643938.14	675474.94	14.4
BM_08	2643886.25	675623.21	14.7
GCP-624	2643745.78	676691.72	13.6
GCP-625	2643298.32	676896.45	14.0
GCP-626	2642992.75	677115.15	13.0
GCP-627	2640819.72	677795.52	12.8
TBM_Karmde School _2 Cheak	2644854.82	678318.55	14.8
GCP-628	2645448.68	678645.55	13.5
GCP-629	2646238.78	678980.30	14.5
GCP-630	2646093.25	679210.59	14.9
GCP-631	2645915.14	679568.80	14.2
GCP-632	2645692.22	679699.67	14.9
GCP-633	2645404.09	679745.68	14.1
GCP-634	2645031.69	679541.58	13.3
GCP-635	2645135.86	679390.52	15.0
GCP-636	2644809.59	679265.41	13.9
GCP-637	2644097.30	681273.68	14.0
GCP-638	2644336.55	681180.25	13.7
GCP-639	2644271.27	680938.11	14.6
GCP-640	2644659.01	680961.03	12.6
GCP-641	2644889.76	681206.95	13.6
GCP-642	2645456.74	681619.57	13.9
GCP-643	2645622.96	681869.48	14.5
GCP-644	2645623.14	682263.03	14.2
GCP-645	2645458.20	682572.47	14.6
GCP-646	2644997.67	683099.43	14.5
GCP-647	2645218.88	682924.43	14.5
GCP-648	2645416.24	682644.23	14.1
GCP-649	2645888.56	681698.32	14.8
GCP-650	2646297.94	681446.64	16.8
TBM-Harabhanga	2646280.05	681384.89	13.8
GCP-651	2646838.71	680961.51	15.1
GCP-652	2647079.59	680870.13	14.6
GCP-653	2647173.10	681157.78	14.7
GCP-654	2647248.65	681425.30	14.8
GCP-655	2647566.89	682920.61	14.9
GCP-656	2647552.70	682789.98	15.3
GCP-657	2647535.14	682562.78	15.2
GCP-658	2647495.96	682340.82	15.0



ID	X	Y	Z
GCP-659	2647362.59	680732.73	15.1
GCP-660	2647732.70	680438.83	15.0
GCP-661	2648013.81	680168.69	14.1
GCP-662	2648303.45	680017.26	16.1
GCP-663	2648599.24	679901.94	15.6
GCP-664	2648960.99	680068.59	16.1
GCP-665	2649155.74	680394.48	15.9
GCP-666	2649349.20	680317.47	14.1
BM_07	2649340.30	680284.48	14.9
GCP-667	2648522.45	679629.96	15.0
GCP-668	2648738.87	678869.10	16.1
GCP-669	2649010.36	678586.13	15.8
BM_0 Chack	2649381.17	680346.06	14.1
BM_00Chack	2649380.98	680346.05	14.0
GCP-670	2648759.45	678598.97	15.3
GCP-671	2649420.31	678427.40	15.3
GCP-672	2649828.75	678274.94	16.1
GCP-673	2650701.64	677985.15	14.1
GCP-674	2651050.48	677906.85	15.4
GCP-675	2650962.75	677580.53	15.2
GCP-676	2651001.56	676301.51	15.5
GCP-677	2650885.79	676856.17	15.3
GCP-678	2650960.43	677095.64	14.8
GCP-679	2650686.20	677412.17	14.7
GCP-680	2650305.03	677807.23	15.0
GCP-681	2650081.47	678030.07	15.5
GCP-682	2649755.27	678001.76	15.1
GCP-683	2649343.93	678010.62	15.2
GCP-684	2648941.99	678115.11	14.9
GCP-685	2648600.57	677932.23	14.5
GCP-686	2647018.04	676929.04	13.1
GCP-687	2646462.38	677148.36	14.3
GCP-688	2646662.25	677546.11	14.4
GCP-689	2646896.97	677987.04	14.1
GCP-690	2646975.79	678175.71	14.0
GCP-691	2646320.71	677672.85	13.8
GCP-692	2646536.01	678148.98	14.5
TBM_HSK School	2646671.85	678402.21	13.6
GCP-693	2646713.26	678629.71	14.7
GCP-694	2646669.03	678764.97	15.0
GCP-695	2646466.82	678910.64	14.1
GCP-696	2646456.30	679211.36	14.2
GCP-697	2646307.68	679730.27	14.5



ID	X	Y	Z
GCP-698	2646580.86	679388.20	14.5
GCP-699	2646910.56	679393.09	13.5
GCP-700	2647402.46	679910.06	13.9
GCP-701	2647573.09	680282.68	14.6
GCP-702	2647289.64	678837.07	15.2
GCP-703	2647478.81	679411.80	14.5
GCP-704	2647853.51	679351.53	15.3
GCP-705	2648130.06	679377.63	15.3
GCP-706	2648291.07	679735.27	15.3
GCP-707	2648092.88	680071.98	13.8
5586-Chack	2631872.23	675223.56	13.5
GCP-708	2632027.08	674606.17	13.7
GCP-709	2632093.36	674195.91	12.5
GCP-710	2631826.66	674564.34	13.3
GCP-711	2631813.13	674870.71	13.4
GCP-712	2631685.30	675226.14	13.8
GCP-713	2631229.64	675302.44	14.0
GCP-714	2630790.97	675156.37	14.2
GCP-715	2630580.15	675136.29	13.8
GCP-716	2630024.77	675078.11	13.5
GCP-717	2628809.27	673789.15	12.2
GCP-718	2629023.74	673989.65	12.9
GCP-719	2629262.56	674282.93	12.2
GCP-720	2629485.15	674499.31	12.2
GCP-721	2629716.89	674659.53	14.0
GCP-722	2629889.60	674859.60	14.3
GCP-723	2630368.62	675340.45	10.0
GCP-724	2631878.65	675387.95	12.9
GCP-725	2633659.16	674360.81	13.9
GCP-726	2633833.91	674842.98	14.5
GCP-727	2633543.29	674063.01	14.0
GCP-728	2633392.06	673640.22	13.8
GCP-729	2632715.86	673037.12	14.2
GCP-730	2632337.95	672982.45	12.9
GCP-731	2632983.56	672943.40	13.9
GCP-732	2633255.28	673140.93	13.1
GCP-733	2633736.20	673030.11	14.1
BM_03	2636366.22	675607.96	14.0
TBM-1cheak	2635348.82	678433.61	13.5
GCP-734	2638317.78	673072.74	13.9
GCP-735	2638384.63	672788.49	14.0
GCP-736	2638674.52	673023.53	13.7
GCP-737	2639067.67	673359.97	13.4



ID	X	Y	Z
GCP-738	2638993.72	673692.25	13.5
GCP-739	2639264.85	674037.04	12.9
GCP-740	2639436.44	674330.71	13.3
GCP-741	2639587.01	674458.14	12.9
GCP-742	2639832.10	674400.53	12.5
GCP-743	2639971.85	674491.72	13.6
GCP-744	2640269.13	674421.09	13.3
GCP-745	2640475.82	674132.47	13.1
GCP-746	2640720.61	673778.62	13.4
GCP-747	2640181.65	674825.05	13.5
GCP-748	2640399.07	675205.13	13.0
GCP-749	2640486.35	675488.62	13.7
GCP-750	2640545.34	676022.81	12.4
GCP-751	2640983.65	675930.91	13.5
GCP-752	2640565.44	676231.60	13.7
GCP-753	2640400.17	676548.04	13.8
GCP-754	2640788.58	677040.11	13.5
GCP-755	2640416.43	676977.48	13.5
GCP-756	2639897.94	676553.68	13.7
GCP-757	2639800.74	676111.00	13.5
GCP-758	2639482.48	676320.77	13.7
GCP-759	2639209.81	676268.33	14.9
GCP-760	2638790.58	676229.55	14.1
TBM-saerbati psc	2636607.85	674279.59	13.5
TBM-saerbati psc cheak	2636608.14	674276.36	13.5
TBM-saerbati psc cheak	2636608.17	674276.37	13.4
GCP-761	2635464.34	674075.81	13.1
GCP-762	2635828.07	674134.12	13.8
GCP-763	2635920.23	674160.19	14.0
GCP-764	2636082.15	674625.30	13.9
GCP-765	2636311.58	674258.06	13.9
GCP-766	2636498.76	674076.57	14.4
GCP-767	2636899.68	673873.54	14.2
GCP-768	2637446.81	673761.22	14.3
GCP-769	2637812.26	673665.74	13.3
GCP-770	2639398.61	669333.86	14.4
GCP-771	2639492.54	669058.35	14.6
GCP-772	2639431.80	668528.86	14.3
GCP-773	2639194.15	668335.27	15.1
GCP-774	2638638.39	668428.43	15.0
GCP-775	2638380.24	668321.18	15.7
GCP-776	2637625.01	667915.76	14.7
GCP-777	2637971.53	668186.45	15.2



ID	X	Y	Z
GCP-778	2638903.75	668738.36	14.0
GCP-779	2639794.00	668254.63	14.8
GCP-780	2639818.65	669276.55	14.5
GCP-781	2640203.07	669378.58	14.2
GCP-782	2640338.87	669884.67	13.5
GCP-783	2640512.25	670370.63	13.1
GCP-784	2640833.18	670371.80	13.4
GCP-785	2641398.39	670453.51	14.3
GCP-786	2640621.30	670613.92	13.3
GCP-787	2640614.56	670964.75	12.1
GCP-788	2640142.50	670003.37	13.4
GCP-789	2639960.44	669844.17	13.8
GCP-790	2639902.90	669507.63	14.3
GCP-791	2638128.08	673448.32	14.3
GCP-792	2637744.83	673499.24	14.1
GCP-793	2636959.15	674156.59	13.7
GCP-794	2636324.30	675346.10	13.5
GCP-795	2636424.32	675017.79	13.4
GCP-796	2636521.44	674531.39	14.2
GCP-797	2636877.29	674810.51	12.9
GCP-798	2638587.68	675530.54	12.2
GCP-799	2638949.18	675485.43	13.5
GCP-800	2638861.70	675171.88	12.8
GCP-801	2638802.67	674870.72	13.3
GCP-802	2639265.54	675116.78	12.6
GCP-803	2639511.26	674878.02	11.4
GCP-804	2639711.28	674871.51	12.5
GCP-805	2639983.18	675232.49	11.1
GCP-806	2640133.59	675693.92	13.6
GCP-807	2640110.39	675990.99	12.9
GCP-808	2640310.10	676165.78	13.1
GCP-809	2639025.19	676565.81	13.6
GCP-810	2638998.74	676827.99	13.9
GCP-811	2638479.71	676228.13	14.4
GCP-812	2638193.14	676548.36	13.5
GCP-813	2637823.07	677014.41	13.5
TBM-09 Word 2	2638152.86	684331.63	12.7
GCP-814	2634150.89	684169.32	12.6
GCP-815	2633873.12	684239.46	12.6
GCP-816	2633401.39	684410.19	13.1
GCP-817	2633088.56	684492.55	12.7
GCP-818	2632577.45	684585.73	12.9
GCP-819	2632054.52	684689.50	13.1



ID	X	Y	Z
GCP-820	2631687.18	684929.85	12.7
GCP-821	2631409.05	685141.58	12.6
GCP-822	2631196.64	685255.12	12.9
GCP-823	2630833.76	685206.58	12.0
GCP-824	2630615.86	685131.18	12.0
GCP-825	2630376.60	685079.59	11.9
GCP-826	2630041.22	684993.03	12.7
BM-4 Chcek	2635876.67	683208.47	12.1
GCP-827	2635470.91	683736.48	13.3
GCP-828	2635581.25	684189.94	13.4
GCP-829	2635639.81	684410.64	14.3
GCP-830	2635687.11	684624.32	14.1
GCP-831	2635856.89	684973.11	13.6
GCP-832	2636033.92	685233.76	13.4
GCP-833	2636054.31	685393.94	13.6
GCP-834	2636099.56	686219.40	13.6
GCP-835	2635963.56	686250.05	13.5
GCP-836	2636514.20	686632.95	13.4
GCP-837	2636913.53	686702.61	13.8
GCP-838	2637126.75	686666.18	14.2
GCP-839	2637295.37	686963.44	13.9
GCP-840	2637342.17	687098.91	14.0
GCP-841	2636722.02	686561.64	12.8
GCP-842	2636217.62	687130.95	13.2
GCP-843	2636124.28	686688.02	14.1
GCP-844	2635940.17	686601.75	13.6
GCP-845	2635478.67	686440.84	13.1
GCP-845	2635100.45	686404.49	12.9
GCP-846	2634875.75	686275.51	13.4
GCP-847	2634965.12	686660.80	12.5
GCP-848	2634721.85	686505.82	13.9
GCP-849	2634344.44	686267.70	11.9
GCP-850	2632880.95	685723.40	12.6
GCP-851	2632600.54	685618.81	12.9
GCP-852	2631635.73	685399.15	12.5
GCP-854	2631921.18	685415.26	12.6
GCP-855	2632367.98	685561.96	13.2
GCP-856	2632975.98	685503.84	14.1
GCP-857 Ep	2633148.14	685143.21	12.2
GCP-858	2633603.03	685428.19	11.1
GCP-859	2634917.51	686109.24	11.4
GCP-860	2635051.08	685789.73	13.3
GCP-861	2635078.30	685326.88	12.9



ID	X	Y	Z
BM_03 Chack	2636366.39	675607.96	13.4
GCP-862	2636048.43	675421.28	13.2
GCP-863	2635725.13	675140.80	14.2
GCP-864	2635241.61	675893.14	12.6
GCP-865	2635334.41	676194.80	13.3
GCP-866	2635016.77	676861.43	11.2
GCP-867	2635258.85	676613.47	12.2
GCP-868	2635593.92	675561.94	13.6
GCP-869	2635590.84	675993.70	13.4
GCP-870	2635605.53	676418.11	12.8
GCP-871	2634557.70	675117.39	13.5
GCP-872	2634723.45	675206.17	13.1
GCP-873	2634422.64	675365.18	13.3
GCP-874	2634556.15	675586.29	12.6
GCP-875	2634900.18	674905.24	13.2
GCP-876	2635065.61	674585.94	13.3
TBM-1 cheak	2635348.79	678433.66	13.5
GCP-877	2636746.12	673433.16	12.4
GCP-878	2636682.95	673240.67	11.5
GCP-879	2636742.79	673067.06	13.2
GCP-880	2637476.31	672718.21	12.3
GCP-881	2637344.36	672708.25	12.9
GCP-882	2636011.28	673624.83	13.4
GCP-883	2636308.53	673624.65	12.8
GCP-884	2636533.49	673618.26	12.3
GCP-885	2635738.97	673513.23	12.6
GCP-886	2635519.91	673633.05	13.3
GCP-887	2634757.24	673911.66	14.9
GCP-888	2635228.29	674396.76	12.5
GCP-889	2634025.40	673236.78	13.2
GCP-890	2634263.35	673383.72	12.9
GCP-891	2634960.78	673649.97	12.8
GCP-892	2635305.32	673840.62	13.6
GCP-893	2635102.68	674012.64	14.5
GCP-894	2634273.48	673930.30	13.3
GCP-895	2633986.72	673796.33	12.8
GCP-896	2633843.44	673674.62	12.1
GCP-897	2633812.18	673838.63	13.1
TBM-09 word 2. cheak	2638152.82	684331.63	12.7
GCP-898	2636845.00	686981.24	14.0
GCP-899	2636917.81	687195.10	12.3
900	2636851.34	687443.52	12.6
GCP-901	2636968.47	687642.33	12.2



ID	X	Y	Z
GCP-902	2636963.18	688211.97	12.9
GCP-903	2637740.14	687833.25	13.4
GCP-904	2637325.91	687289.92	14.3
GCP-905	2635599.53	687513.26	12.7
GCP-906	2635432.87	687241.45	13.1
GCP-907	2635568.89	686997.60	12.7
GCP-908	2635487.81	686696.70	12.6
GCP-909	2635676.58	686070.02	12.8
GCP-910	2636663.56	688010.34	13.4
TBM-09 Word 2 cheak	2638152.78	684331.63	12.7
GCP-910	2638436.92	684410.49	12.0
GCP-911	2638673.90	684517.93	12.1
GCP-912	2638721.97	684395.42	12.4
GCP-913	2638889.73	684757.29	12.0
GCP-914	2638718.17	685176.61	13.0
GCP-915	2639379.55	684414.37	12.7
GCP-916	2639281.34	683989.98	12.3
GCP-917	2638907.97	684031.58	13.4
GCP-918	2639190.97	684042.68	12.4
GCP-919	2639416.94	683433.76	12.5
GCP-920	2638340.40	683509.57	13.5
GCP-921	2637659.11	685544.12	11.2
TBM-09 Word 2 cheak	2638152.82	684331.62	12.7
GPS 5584 cheak	2644074.22	673227.89	12.6
GCP-922	2643557.93	673034.18	11.9
GCP-923	2643175.80	672954.69	11.9
GCP-924	2642785.79	672920.03	12.2
GCP-925	2639608.49	673324.66	12.0
GCP-926	2639874.99	673309.07	12.8
GCP-927	2640192.76	673577.79	11.7
GCP-928	2640450.58	673639.85	11.9
GCP-929	2640677.36	673721.48	11.5
GCP-930	2640941.52	673430.88	12.7
GCP-931	2640071.23	673302.29	13.4
GCP-932	2638961.16	669700.87	13.1
GCP-933	2638875.98	669184.63	13.5
BM-05	2639320.96	668204.44	15.7
TBM-09 Word 2 cheak	2638152.84	684331.66	12.8
GCP-934	2638683.57	685735.64	12.4
GCP-935	2638444.73	685835.31	12.6
GCP-936	2638412.95	686352.53	12.6
GCP-937	2637871.74	686471.63	12.7
GCP-938	2637664.49	686491.79	12.4



ID	X	Y	Z
GCP-939	2637569.74	687550.72	13.5
GCP-940	2637810.89	687963.66	13.4
GCP-941	2637127.60	688507.86	13.2
GCP-942	2638475.15	688529.30	13.3
GCP-943	2638695.93	688515.90	13.2
GCP-944	2638961.42	688972.36	13.2
GCP-945	2638353.96	689257.70	12.6
GCP-946	2639624.74	689860.75	12.1
GCP-947	2639752.88	689631.25	13.6
TBM -39 NO -PSC--Check	2640678.74	688534.78	14.0
TBM -39 NO -PSC	2640681.09	688539.08	13.5
TBM-1 Chacek	2635348.77	678433.68	13.6
GCP-948	2637053.82	678241.48	11.5
GCP-949	2636968.73	677848.06	11.3
GCP-950	2637460.95	677401.15	11.2
GCP-951	2638145.27	676968.77	12.2
GCP-952	2638428.89	676567.26	12.3
GCP-953	2638113.90	676160.47	12.5
GCP-954	2637917.15	676257.90	12.1
GCP-955	2637622.82	676541.37	12.5
GCP-956	2637377.11	676825.77	12.7
GCP-957	2637046.66	676976.60	12.5
GCP-958	2637061.23	677353.67	11.6
GCP-959	2636831.18	677588.95	11.6
GCP-960	2636603.04	677897.66	12.3
TBM-09 Word 2 cheak	2638152.86	684331.65	12.7
GCP-961	2637721.40	684919.93	11.8
GCP-962	2637509.18	684934.87	12.4
GCP-963	2637450.80	685009.17	12.7
GCP-964	2637553.87	684726.66	12.7
GCP-965	2640006.69	686976.11	13.7
GCP-966	2640253.23	687494.74	11.0
GCP-967	2640307.27	687761.97	12.0
GCP-968	2640588.16	688238.22	12.4
GCP-969	2640160.66	688543.11	12.4
BM--11 Cheak	2637028.89	679040.75	11.8
GCP-970	2639294.45	678956.67	12.4
GCP-971	2639156.37	679336.01	11.3
GCP-972	2639660.28	678341.84	12.4
GCP-973	2639858.27	678822.86	12.1
GCP-974	2640287.57	679456.55	13.0
GCP-975	2640179.26	679712.00	12.0
GCP-976	2640076.58	680166.33	11.7



ID	X	Y	Z
GCP-977	2639098.44	680581.79	11.5
GCP-978	2639074.20	680046.06	11.3
GCP-979	2639327.26	679878.39	11.6
GCP-980	2638594.72	680463.64	12.8
GCP-981	2638250.15	680978.33	10.2
GCP-982	2638076.06	681387.64	10.6
GCP-983	2638700.30	679620.72	11.6
GCP-984	2638908.73	679355.53	10.7
GCP-985	2638727.36	679100.43	11.5
GCP-986	2638567.51	680035.37	12.3
GCP-987	2638324.89	680281.35	10.4
GCP-988	2638149.67	680110.59	10.7
GCP-989	2637535.18	680463.66	10.4
GCP-990	2637516.98	680386.49	11.2
GCP-991	2637396.40	680823.05	10.9
GCP-992	2637559.90	680955.73	10.5
GCP-993	2637416.48	681207.75	11.0
GCP-994	2637795.24	680257.75	11.2
GCP-995	2637648.93	680059.77	11.9
BM-4 Cheak	2635876.73	683208.50	12.1
GCP-996	2635846.19	684414.65	11.9
GCP-997	2636149.27	685217.94	12.3
GCP-998	2636099.54	685706.03	12.2
GCP-999	2637902.58	686464.73	12.6
GCP-1000	2639288.27	688383.63	13.0
GCP-1001	2638799.91	687603.33	12.7
GCP-1002	2638685.95	687811.48	12.9
GCP-1003	2638523.50	688037.77	13.2
GCP-1004	2638198.35	687832.26	13.2
GCP-1005	2638229.01	687360.72	12.5
GCP-1006	2638190.93	686925.13	12.6
GCP-1007	2635722.17	685558.78	12.3
GCP-1008	2635623.61	685081.99	12.3
GCP-1009	2635434.93	684805.81	12.9
GCP-1010	2635389.94	684522.78	12.1
GCP-1011	2635070.44	684468.07	12.8
GCP-1012	2635149.84	684761.08	12.3
GCP-1013	2635195.57	685453.54	12.1
GCP-1014	2634948.84	685437.11	11.9
GCP-1015	2634910.34	685770.96	12.0
GCP-1016	2635206.31	686237.54	12.5
GCP-1017	2634384.20	686179.03	11.7
GCP-1018	2633979.51	686126.08	11.6



ID	X	Y	Z
GCP-1019	2633379.01	685861.78	11.5
GCP-1020	2632067.40	685277.03	11.3
GCP-1021	2634672.27	683384.41	11.4
GCP-1022	2635145.67	683782.59	12.5
BM-4 cheak	2635876.80	683208.48	12.1
GCP-1023	2634836.98	685110.16	12.0
GCP-1024	2634533.75	685346.73	10.3
GCP-1025	2634880.42	684841.58	12.1
GCP-1026	2634367.86	684926.15	11.8
GCP-1027	2633943.76	684808.48	10.8
GCP-1028	2633645.76	684650.88	10.9
GCP-1029	2633105.47	684194.46	11.4
BM-4 Cheak	2635876.82	683208.49	12.1
GCP-1030	2633056.73	683965.25	11.3
GCP-1031	2633046.77	683622.71	11.8
GCP-1032	2633267.02	683650.42	11.1
GCP-1033	2632382.05	683527.38	11.4
GCP-1034	2631411.45	684091.45	12.7
GCP-1035	2631164.92	684980.35	11.3
GCP-1036	2631723.66	684710.18	11.7
GCP-1037	2631891.54	684919.74	11.5
GCP-1038	2632501.09	684493.54	11.1
GCP-1039	2632826.56	684674.36	12.0
GCP-1040	2633104.98	684713.47	12.1
GCP-1041	2634034.05	683985.67	12.2
GCP-1042	2634457.14	684016.46	12.2
GCP-1043	2633918.07	683023.78	11.5
GCP-1044	2633738.42	682842.73	11.0
GCP-1045	2636135.84	682630.54	11.1
GCP-1046	2636995.39	682726.48	12.5
GCP-1047	2636930.75	683116.12	12.0
GCP-1048	2637930.71	683215.10	12.7
GCP-1049	2637891.23	683500.58	12.4
TBM-2 Cheak	2635345.77	678432.03	13.5
GCP-1050	2636321.07	679509.43	11.5
GCP-1051	2637299.22	679824.80	12.3
GCP-1052	2636736.93	680057.89	10.7
GCP-1053	2636595.93	680552.92	12.5
GCP-1054	2636499.38	680835.98	10.5
GCP-1055	2636487.75	681156.49	12.0
GCP-1056	2636176.97	681025.81	11.6
GCP-1057	2636666.78	681472.49	12.0
GCP-1058	2636851.81	681683.36	11.5



ID	X	Y	Z
GCP-1059	2636992.06	681960.01	11.6
GCP-1060	2636898.50	682216.32	11.8
GCP-1061	2636448.91	682303.28	12.2
GCP-1062	2636219.10	682382.35	12.0
GCP-1063	2637472.96	681890.67	11.2
GCP-1064	2636091.98	683159.17	11.8
GCP-1065	2636269.60	683142.47	12.2
GCP-1066	2636223.53	683883.37	11.6
GCP-1067	2636182.81	684154.97	12.0
GCP-1068	2636712.47	683812.04	12.5
GCP-1069	2637266.23	683777.89	12.1
GCP-1070	2637420.11	683539.39	11.8
GCP-1071	2636263.88	685866.86	12.4
GCP-1072	2636035.51	685836.05	11.7
GCP-1073	2636707.81	686563.88	12.6
GCP-1074	2636591.61	686091.80	12.6
GCP-1075	2636450.88	686170.94	12.5
GCP-1076	2635413.92	681651.58	9.9
GCP-1077	2636383.87	681664.57	11.6
GCP-1078	2636068.38	681587.70	10.8
GCP-1079	2635916.73	681770.78	11.0
GCP-1080	2635634.08	680622.45	10.6
GCP-1081	2635857.48	680278.68	11.5
GCP-1082	2635513.31	680075.08	11.3
TBM-09 Word 2 cheak	2638152.81	684331.63	12.7
GCP-1083	2639028.41	685674.71	11.9
GCP-1084	2639900.47	685360.33	12.2
GCP-1085	2640244.43	684712.09	12.5
GCP-1086	2640459.31	684379.82	12.0
GCP-1087	2640096.25	684230.87	12.1
GCP-1088	2640288.03	683906.92	11.9
GCP-1089	2640491.98	682879.24	12.2
GCP-1090	2640143.74	682439.89	12.8
GCP-1091	2639890.98	682139.95	12.3
GCP-1092	2639588.95	682436.57	12.4
GCP-1093	2639586.59	682850.70	13.8
GCP-1094	2639712.85	683429.16	11.2
GCP-1095	2639667.29	683239.53	11.9
GCP-1096	2639402.10	684764.86	13.7
GCP-1097	2639248.88	685769.78	11.6
GCP-1098	2638889.03	686242.10	12.0
GCP-1099	2638878.56	686977.04	11.9
GCP-1100	2638766.82	687032.29	13.8



ID	X	Y	Z
GCP-1101	2637404.06	686700.73	12.3
GCP-1102	2636747.26	686371.05	12.4
TBM-09 word 2 cheak	2638152.80	684331.68	12.8
GCP-1103	2640056.63	685630.64	12.1
GCP-1104	2640491.70	685853.45	12.5
GCP-1105	2640365.42	685259.48	12.1
GCP-1106	2640989.89	686540.49	12.3
GCP-1107	2640606.23	686943.66	12.0
GCP-1108	2640504.04	686636.53	12.4
GCP-1109	2640020.82	686733.69	13.3
GCP-1110	2639730.49	687418.06	12.4
GCP-1111	2639600.99	688395.51	12.4
GCP-1112	2639400.39	688898.28	12.7
GCP-1113	2640627.22	690416.74	12.8
GCP-1114	2640219.97	690517.97	13.2
GCP-1115	2639986.62	690399.24	13.0
GCP-1116	2640611.38	691315.66	12.4
GCP-1117	2640687.23	691000.09	12.6
GCP-1118	2640748.72	690639.92	12.7
GCP-1119	2641155.74	690465.37	12.6
GCP-1120	2641315.77	690069.23	12.8
GCP-1121	2641787.03	690266.30	12.9
GCP-1122	2641693.00	690033.08	13.2
GCP-1123	2641565.17	689791.41	13.7
GCP-1124	2641644.17	689638.87	13.9
GCP-1125	2640082.19	688651.15	12.8
GCP-1126	2641095.61	687608.69	12.9
GCP-1127	2641899.91	686212.12	12.6
GCP-1128	2642185.23	686929.38	12.9
GCP-1129	2642644.06	687779.76	13.0
GCP-1130	2640491.02	681404.39	11.9
GCP-1131	2639771.44	681644.56	11.9
GPS-5588 cheak	2643140.28	683575.49	13.9
GCP-1132	2643592.28	689220.02	11.5
GCP-1133	2643463.04	689301.34	12.7
GCP-1134	2643704.73	690094.11	13.1
GCP-1135	2643225.61	690096.87	13.1
GCP-1136	2643491.29	690278.91	12.7
GCP-1137	2643962.70	690322.67	13.3
GCP-1138	2644263.84	690080.15	13.3
GCP-1139	2645085.75	689674.57	12.7
GCP-1140	2645395.17	689974.22	13.1
GCP-1141	2645494.61	690119.58	13.7



ID	X	Y	Z
GCP-1142	2646018.12	689799.23	12.9
GCP-1143	2646193.83	689647.18	13.8
GCP-1144	2646519.95	689334.59	13.5
GCP-1145	2647402.42	688940.00	12.0
GCP-1146	2647495.94	688321.77	12.8
GCP-1147	2647559.27	686289.80	13.6
GCP-1148	2648009.22	686224.21	13.4
GCP-1149	2645793.42	685665.10	14.3
GCP-1150	2645335.76	685704.28	14.1
GCP-1151	2645591.74	685807.45	13.6
GCP-1152	2645438.72	685110.05	14.3
GCP-1153	2644905.17	685137.21	14.2
GPS-5588 cheak	2643140.35	683575.51	13.9
GCP-1154	2642864.25	682848.79	13.3
GCP-1155	2643085.13	682875.39	13.0
GCP-1156	2643395.17	682499.31	12.8
GCP-1157	2643469.80	682737.53	12.6
GCP-1158	2643402.03	682984.90	12.9
GCP-1159	2643865.53	682919.55	13.6
GCP-1160	2643917.96	682527.32	13.1
GCP-1161	2644021.92	682699.60	13.5
GCP-1162	2644058.60	682262.78	13.3
GCP-1163	2644086.19	681844.34	13.0
GCP-1164	2644196.82	681418.12	12.1
GCP-1165	2644254.55	679705.08	12.2
GCP-1166	2644492.50	679389.91	12.3
GCP-1167	2644950.83	679627.26	13.0
GCP-1168	2645427.13	680167.37	13.7
GCP-1169	2645203.69	679869.23	12.6
GCP-1170	2645719.08	680876.69	13.1
GCP-1171	2645785.53	680571.22	13.2
GCP-1172	2645559.42	680411.44	13.1
GCP-1173	2645149.59	680589.06	12.5
GCP-1174	2644871.82	680799.29	13.2
GCP-1175	2644806.73	681183.31	13.8
GCP-1176	2645105.02	681350.44	13.2
GCP-1177	2645335.69	683417.37	13.3
GCP-1178	2645674.79	683300.65	13.5
GCP-1179	2645900.46	683326.05	13.5
GCP-1180	2646189.09	683418.08	13.6
GCP-1181	2646297.87	683467.35	13.7
GCP-1182	2646532.34	683765.53	13.9
GCP-1183	2646753.64	683973.20	14.2



ID	X	Y	Z
GCP-1184	2647055.51	684057.98	14.2
GCP-1185	2647602.70	683087.35	14.2
GCP-1186	2647631.35	684518.19	12.5
BM-5588 chaek	2643140.30	683575.50	13.9
GCP-1187	2643746.90	686683.12	13.8
GCP-1188	2643669.13	687297.41	13.3
GCP-1189	2644088.02	687403.38	13.1
GCP-1190	2644056.10	687682.35	13.2
GCP-1191	2643724.57	687781.65	13.0
GCP-1192	2643947.62	687952.35	13.1
GCP-1193	2644314.54	687959.63	13.1
GCP-1194	2644170.47	688258.67	14.1
GCP-1195	2644542.92	688291.64	12.8
GCP-1196	2646278.89	688928.97	13.4
GCP-1197	2647423.82	688924.08	12.5
GCP-1198	2647288.64	688741.90	13.3
GCP-1199	2646721.46	689214.04	12.7
GCP-1200	2646906.46	688995.91	13.0
GCP-1201	2647806.30	688496.11	11.5
GCP-1202	2647725.60	688154.91	12.6
GCP-1203	2647836.97	687856.26	13.8
GCP-1204	2648046.00	687592.12	13.5
GCP-1205	2648151.98	685898.23	15.1
5586-cheak	2631872.31	675223.57	13.5
GCP-1206	2631005.11	674353.60	13.1
GCP-1207	2630808.41	674354.94	10.8
GCP-1208	2630379.88	674231.66	12.0
GCP-1209	2630144.09	674057.49	11.9
GCP-1210	2630000.85	673501.78	12.7
GCP-1211	2630624.54	674597.10	12.4
GCP-1212	2629863.60	675128.89	9.5
GCP-1213	2629270.44	674040.67	11.2
GCP-1214	2628887.57	673715.05	9.7
GCP-1215	2628804.09	674466.09	12.0
GCP-1216	2628951.85	674896.51	11.6
GCP-1217	2628773.29	675733.68	11.8
GCP-1218	2628537.68	674748.50	12.6
GCP-1219	2628445.68	675336.09	13.5
GCP-1220	2628496.12	675693.00	12.1
GCP-1221	2628480.49	675960.23	11.6
GCP-1222	2627970.28	676190.76	10.5
GCP-1223	2628298.62	676378.55	11.6
GCP-1224	2628536.00	676587.73	10.9



ID	X	Y	Z
GCP-1225	2628863.41	676852.69	10.1
GCP-1226	2629132.43	676991.31	10.4
GCP-1227	2629414.87	677207.45	10.4
GCP-1228	2630279.58	676578.66	11.5
GCP-1229	2630247.71	676278.18	11.4
GCP-1230	2630180.97	676011.45	10.4
GCP-1231	2629511.68	676234.82	12.6
GCP-1232	2630051.84	675538.17	10.3
GCP-1233	2630351.37	675345.08	12.8
GCP-1234	2630454.85	675709.08	10.5
GCP-1235	2630733.24	675841.15	12.0
GCP-1236	2630620.42	676022.96	8.8
GCP-1237	2631121.73	676023.09	10.5
5586-cheak	2631872.26	675223.55	13.5
GCP-1238	2632267.59	673996.09	13.0
GCP-1239	2630663.06	673676.55	11.5
GCP-1240	2630868.80	673474.27	12.7
GCP-1241	2631073.71	673755.19	13.0
GCP-1242	2631291.83	673882.89	11.6
GCP-1243	2631647.26	673888.61	12.9
GCP-1244	2631530.58	674176.61	12.7
GCP-1245	2632566.36	674682.87	12.8
GCP-1246	2632319.40	675729.15	12.0
GCP-1247	2632127.80	675492.43	10.7
GCP-1248	2632327.71	675325.99	11.3
GCP-1249	2632658.04	675213.56	12.5
GCP-1250	2632954.56	675038.28	12.5
GCP-1251	2633180.92	674746.38	13.1
GCP-1252	2631761.82	673464.06	12.4
GCP-1253	2631754.77	673111.85	11.6
GCP-1254	2632158.73	673740.46	11.9
GCP-1255	2632245.97	673488.04	12.6
GCP-1256	2632737.77	673445.78	12.8
GCP-1257	2633191.45	674269.26	12.1
GCP-1258	2633764.87	675902.39	11.8
GCP-1259	2633585.04	676008.33	12.1
GCP-1260	2633358.40	676230.38	11.7
GCP-1261	2633091.86	676502.13	12.1
GCP-1262	2632956.86	676075.59	11.3
GCP-1263	2632902.91	676207.93	12.0
GCP-1264	2632518.80	676420.20	12.2
GCP-1265	2632293.01	676329.94	12.0
GCP-1266	2631993.70	676252.68	12.4



ID	X	Y	Z
GCP-1267	2631826.14	676266.76	11.8
GCP-1268	2631806.91	675766.49	11.9
GCP-1269	2631748.18	675984.40	10.3
5586 -cheak	2631872.26	675223.56	13.5
GCP-1270	2629618.41	676021.92	13.0
GCP-1271	2629869.47	676234.88	13.3
GCP-1272	2629754.41	677743.52	11.5
GCP-1273	2628961.18	677385.62	11.7
GCP-1274	2628671.03	677538.43	12.0
GCP-1275	2628607.33	678391.04	13.1
GCP-1276	2628809.36	678591.83	11.7
GCP-1277	2628987.68	679039.62	11.6
GCP-1278	2629013.42	678349.24	10.8
GCP-1279	2629382.95	678969.30	11.3
GCP-1280	2628443.93	679540.79	12.2
GCP-1281	2628561.32	679342.28	11.3
GCP-1282	2628444.87	679031.79	11.7
GCP-1283	2628535.30	678784.98	12.3
GCP-1284	2628459.04	678491.37	12.1
GCP-1285	2627700.87	678242.50	11.8
GCP-1286	2627807.12	678733.37	10.9
GCP-1287	2628028.02	678939.61	12.1
GCP-1288	2628086.01	679363.92	11.8
GCP-1289	2626681.72	679769.75	10.0
GCP-1290	2626928.98	679809.48	10.5
GCP-1291	2627194.35	679701.56	10.5
GCP-1292	2627535.10	679673.80	10.7
GCP-1293	2627974.29	679616.18	10.5
GCP-1294	2627663.63	680184.46	10.2
GCP-1295	2628023.97	680042.53	10.4
GCP-1296	2626559.90	680494.97	13.4
GCP-1297	2626962.75	680850.68	12.7
GCP-1298	2627170.75	680917.88	11.6
GCP-1299	2627429.30	680723.94	11.5
GCP-1300	2627692.37	680833.34	11.4
GCP-1301	2627951.35	680678.63	11.3
TBM-2 cheak	2635345.81	678432.01	13.5
GCP-1302	2630854.98	680706.42	12.3
GCP-1303	2630120.35	680206.42	13.8
GCP-1304	2629966.26	680371.15	12.1
GCP-1305	2630095.86	680624.44	11.6
GCP-1306	2629955.17	680816.17	12.1
GCP-1307	2630220.32	680984.16	10.7



ID	X	Y	Z
GCP-1308	2629804.92	681222.25	11.3
GCP-1309	2629823.42	681780.37	12.5
GCP-1310	2629626.85	681572.87	10.9
GCP-1311	2629235.57	681396.06	11.9
GCP-1312	2629072.04	681231.66	11.7
GCP-1313	2628505.46	681705.85	10.6
GCP-1314	2628249.69	681601.30	10.9
GCP-1315	2627811.51	681482.38	11.0
GCP-1316	2627652.09	681532.41	10.9
GCP-1317	2627399.78	681570.69	10.1
GCP-1318	2627164.51	681505.96	9.8
GCP-1319	2626848.77	681433.84	9.9
GCP-1320	2626640.82	681420.36	9.8
GCP-1321	2628214.09	681913.03	12.6
GCP-1322	2628823.79	682157.08	9.9
GCP-1323	2629387.54	682319.34	12.0
GCP-1324	2629703.72	681964.99	13.7
GCP-1325	2630098.44	682117.38	11.9
GCP-1326	2630424.12	682224.56	12.7
GCP-1327	2630565.80	683545.73	11.1
GCP-1328	2630683.34	683846.66	11.0
GCP-1329	2630792.24	684118.93	12.2
GCP-1330	2630753.74	684261.05	11.4
BM-5588 cheak	2643140.35	683575.51	13.8
GCP-1331	2644218.80	684538.21	13.9
GCP-1332	2644502.11	684697.79	14.2
GCP-1333	2644867.09	684741.51	10.6
GCP-1334	2645416.90	684745.79	13.4
GCP-1335	2646273.11	684755.80	13.3
TBM-1947 Nehal	2646797.58	685565.05	14.3
TBM-1947 Nehal 2	2646799.02	685568.41	14.2
TBM-1947 Nehal 2 cheak	2646799.02	685568.40	14.0
GCP-1336	2646207.82	684978.95	12.6
GCP-1337	2646935.62	685273.17	14.3
GCP-1338	2646902.34	686627.88	12.7
GCP-1339	2647035.65	686212.88	13.0
GCP-1340	2647177.85	685870.84	13.1
GCP-1341	2647258.14	685631.47	13.6
GCP-1342	2647091.74	685443.98	14.7
GCP-1343	2647302.90	685263.90	14.5
GCP-1344	2647645.90	685490.01	14.5
GCP-1345	2647927.42	685660.34	12.5
GCP-1346	2648480.44	685852.80	11.3



ID	X	Y	Z
GCP-1347	2647825.95	686035.75	13.0
GCP-1348	2647182.26	687708.13	14.2
GCP-1349	2647523.47	687514.64	12.8
GCP-1350	2647250.20	687875.11	13.9
GCP-1351	2647214.41	688190.47	14.4
GCP-1352	2646107.54	688049.50	12.5
GCP-1353	2645869.86	687979.82	13.1
GCP-1354	2645501.07	687884.13	12.4
GCP-1355	2646993.88	687950.85	14.7
GCP-1356	2645941.42	685255.21	13.9
GCP-1357	2646953.07	684475.76	14.0
GCP-1358	2647142.68	684481.38	12.8
GCP-1359	2647397.20	684515.74	13.1
GCP-1360	2645997.14	683930.47	13.0
GCP-1361	2645627.46	684077.33	13.7
TBM-1947 Nehal 2 cheak	2646799.04	685568.41	14.2
GCP-1362	2647855.08	682044.45	15.0
GCP-1363	2648003.84	682320.88	14.7
GCP-1364	2648257.50	681889.22	13.4
GCP-1365	2648881.94	681933.89	12.7
GCP-1366	2649086.01	681915.14	13.0
GCP-1367	2649393.64	681825.14	14.6
GCP-1368	2649634.20	681832.81	12.9
GCP-1369	2649869.98	681928.69	13.1
GCP-1370	2650368.61	682416.11	14.2
GCP-1371	2650246.71	682103.98	13.6
GCP-1372	2649942.04	682506.91	14.3
GCP-1373	2649963.19	682731.68	13.0
GCP-1374	2649941.81	682986.58	13.3
GCP-1375	2649699.63	683267.38	13.2
GCP-1376	2649673.69	683618.94	13.9
GCP-1377	2649819.38	684011.66	14.2
GCP-1378	2650236.33	684208.63	17.1
GCP-1379	2652017.88	683678.40	12.2
GCP-1380	2651749.91	683432.07	13.9
GCP-1381	2651468.43	683256.79	14.0
GCP-1382	2651796.36	682667.46	14.7
GCP-1383	2652079.89	682719.91	13.9
GCP-1384	2652615.63	682601.78	13.6
GCP-1385	2652354.92	682372.27	15.0
GCP-1386	2652144.70	682060.71	13.8
GCP-1387	2651887.97	681833.84	14.6
GCP-1388	2651580.10	681655.62	14.7



ID	X	Y	Z
GCP-1389	2651272.21	681541.00	14.3
GCP-1390	2650960.79	681239.41	13.3
GCP-1391	2650478.51	681241.37	13.2
GCP-1392	2648719.68	681443.56	14.2
GPS-5588 cheak	2643140.31	683575.51	13.8
GCP-1393	2641231.19	682837.83	11.9
GCP-1394	2641404.19	682699.35	12.1
GCP-1395	2641386.91	682482.97	12.4
GCP-1396	2641671.27	681990.59	12.1
GCP-1397	2641630.65	681622.07	12.3
GCP-1398	2641649.47	681354.30	12.4
GCP-1399	2641924.63	681096.38	11.9
GCP-1400	2642013.76	680923.09	12.2
GCP-1401	2642085.00	680048.30	12.6
GCP-1402	2641973.10	680245.17	12.6
GCP-1403	2642125.48	680599.52	11.4
GCP-1404	2642354.35	680450.14	12.0
GCP-1405	2642624.77	680508.23	12.2
GCP-1406	2643799.33	682264.41	12.9
GCP-1407	2643781.88	682007.44	14.8
GCP-1408	2643538.40	680941.90	12.6
GCP-1409	2642933.81	680326.47	13.6
GCP-1410	2643111.30	680106.92	13.7
GCP-1411	2643396.39	679749.27	13.3
GCP-1412	2643211.60	679408.59	13.1
GCP-1413	2643185.60	679134.75	13.4
GCP-1414	2643394.56	678930.55	12.3
GCP-1415	2643733.73	678737.54	12.5
GCP-1416	2644025.39	678831.23	12.7
GCP-1417	2644101.65	677636.80	12.8
GCP-1418	2643778.57	677614.01	12.2
TBM-2 cheak	2635345.75	678432.03	13.5
GCP-1419	2636306.87	678062.40	12.9
GCP-1420	2636196.85	677719.50	11.3
GCP-1421	2635950.94	677391.51	12.8
GCP-1422	2636647.93	676861.91	11.5
GCP-1423	2636618.02	677101.74	11.8
GCP-1424	2636534.82	677191.04	11.5
GCP-1425	2636336.10	677133.06	12.7
GCP-1426	2635998.34	677106.15	11.5
GCP-1427	2636305.28	676062.69	11.7
GCP-1428	2636680.01	675849.22	11.6
GCP-1429	2636865.61	674734.74	13.0



ID	X	Y	Z
GCP-1430	2637205.56	674901.21	13.1
GCP-1431	2637160.15	675380.75	13.0
GCP-1432	2637612.97	675455.41	12.1
GCP-1433	2637941.38	675630.13	13.0
GCP-1434	2638241.77	675772.38	12.8
GCP-1435	2638519.23	675961.47	12.5
GCP-1436	2639073.81	675996.83	12.4
GCP-1437	2638521.25	675461.49	12.8
GCP-1438	2638712.91	674511.53	13.2
GCP-1439	2638787.90	674274.76	9.9
GCP-1440	2638704.54	674027.12	12.3
GCP-1441	2638734.96	673790.04	12.4
GCP-1442	2638721.04	673545.54	12.8
GCP-1443	2638104.71	673610.24	12.5
GCP-1444	2637651.19	673953.05	12.8
GCP-1445	2637559.64	674079.50	12.6
GCP-1446	2637677.80	674456.96	12.9
GCP-1447	2637797.92	674809.75	13.0
GCP-1448	2637839.00	675115.00	12.3
GCP-1449	2637815.80	675316.71	14.1
GPS-5588 Cheak	2643140.29	683575.50	13.9
GCP-1450	2644715.45	683258.18	14.0
GCP-1451	2644855.46	683389.16	13.8
GCP-1452	2646070.51	681608.45	15.1
GCP-1453	2648855.64	678992.09	11.0
GCP-1454	2649487.49	678936.57	13.6
GCP-1455	2649477.31	678734.37	13.0
GCP-1456	2649459.49	678569.33	13.9
GCP-1457	2650364.72	678201.40	14.5
GCP-1458	2651053.27	678046.10	14.6
GCP-1459	2651693.23	678949.42	14.3
GCP-1460	2651616.82	678505.45	14.6
GCP-1461	2651509.21	678033.06	14.6
5588 Chack	2643140.33	683575.50	13.8
GCP-1462	2643376.29	689590.83	12.8
GCP-1463	2643312.47	689525.12	12.9
TBM-1Chacek	2635349.49	678433.66	13.4
GCP-1464	2636780.51	676700.89	12.2
GCP-1465	2637199.17	675003.65	13.3
GCP-1466	2637246.90	675333.10	12.4
GCP-1467	2637743.07	675413.90	12.7
GCP-1468	2638023.47	675520.97	12.3
GCP-1469	2638311.85	675494.94	13.9



ID	X	Y	Z
GCP-1470 Ep	2638772.03	674597.67	12.9
GCP-1471	2638746.63	674305.59	12.6
GCP-1472	2638702.11	673780.04	12.4
GCP-1473	2637629.22	674267.42	12.9
GCP-1474	2637806.92	674701.94	12.4
GCP-1475	2637855.37	674944.46	12.5
GCP-1476	2637786.14	675316.72	15.1
TBM-2Chaceh	2635345.79	678432.02	13.5
GCP-1477	2639943.21	677901.20	13.8
GCP-1478	2639912.64	677482.70	13.0
GCP-1479	2639907.98	677482.02	12.9
GCP-1480	2640123.66	678110.95	14.0
GCP-1481	2640485.90	677957.07	12.7
GCP-1482	2641313.19	677886.56	9.9
GCP-1483	2641652.95	677926.84	13.1
GCP-1484	2641927.14	677646.35	14.1
GCP-1485	2642163.23	677536.20	12.8
GCP-1486	2642562.29	677390.94	11.9
GCP-1487	2642621.66	677801.63	12.2
GCP-1488	2642565.57	678047.04	12.2
GCP-1489	2642659.37	678050.72	12.4
GCP-1490	2643663.04	678207.89	12.7
GCP-1491	2643354.95	678029.96	12.5
GCP-1492	2643116.00	677955.48	12.3
GCP-1493	2642836.38	677730.14	12.8
GCP-1494	2643182.68	676615.55	13.8
GCP-1495	2642488.64	677029.03	12.3
GCP-1496	2642256.79	676953.54	13.4
GCP-1497	2641664.08	676835.21	12.8
GCP-1498	2641205.30	676868.83	12.5
GCP-1499	2641590.33	675785.74	12.3
GCP-1500	2642027.22	675722.63	14.0
GCP-1501	2642413.46	675572.96	11.5
GCP-1502	2642738.28	675237.10	12.0
GCP-1503	2643417.17	675864.77	13.5
GCP-1504	2642941.20	674541.15	11.8
GCP-1505	2642391.28	674420.86	14.6
GCP-1506	2642073.52	674207.56	11.2
GCP-1507	2641886.84	674089.85	12.3
GCP-1508	2641289.06	673839.34	12.0
GCP-1509	2640993.58	673329.72	11.6
GCP-1510	2640207.24	673035.38	11.4
GCP-1511	2638749.27	669663.90	13.7

ID	X	Y	Z
GCP-1512	2638037.90	669037.29	13.6
GCP-1513	2638229.89	669712.63	12.9
GCP-1514	2638180.01	669483.41	13.3
GCP-1515-Ep	2638107.23	669182.02	14.1
GCP-1516	2637480.18	668683.03	12.4
GCP-1517	2639773.64	670810.90	12.5
GCP-1518	2639730.37	671229.61	12.6

3.2.3 UAV Image Capturing

After setting out GCP markers and pre-flight check, images had been captured by UAV according to the flight plan in the presence of the authority concerned by a drone pilot. Images were captured with **80% front and 65% side overlap**. During the drone survey, the drone was controlled using a remote controller, which had a reliable connection and sufficient range. The Ground Sample Distance (GSD) of the images were equal or less than **10cm**. All raw images will have image coordinate and orientation data. These position and orientation data will be used in aerial triangulation process.

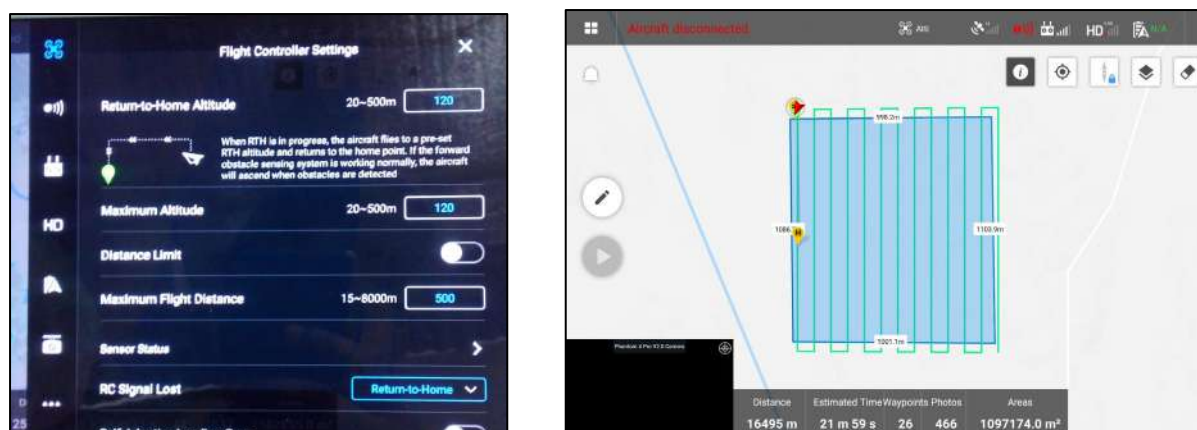


Figure 3-6: Parameter Setting Before Drone Fly in DJI Pilot App

After setting up all parameters, the flight plan was uploaded into the UAV, the UAV will be ready for take-off for image capturing. The UAV will go back to Return-To-Home (RTH) automatically when the mission is complete. During the survey we ensured that the drone survey was conducted in good weather and in the presence of sunlight from 10 am to 4 pm as specified in the **ToR**. Below are the things that have been considered before UAV Flight:

- Check for local regulations that may impact the ability to fly a drone.
- Specifications of the drone and camera.
- Weather conditions and characteristics of the survey area.

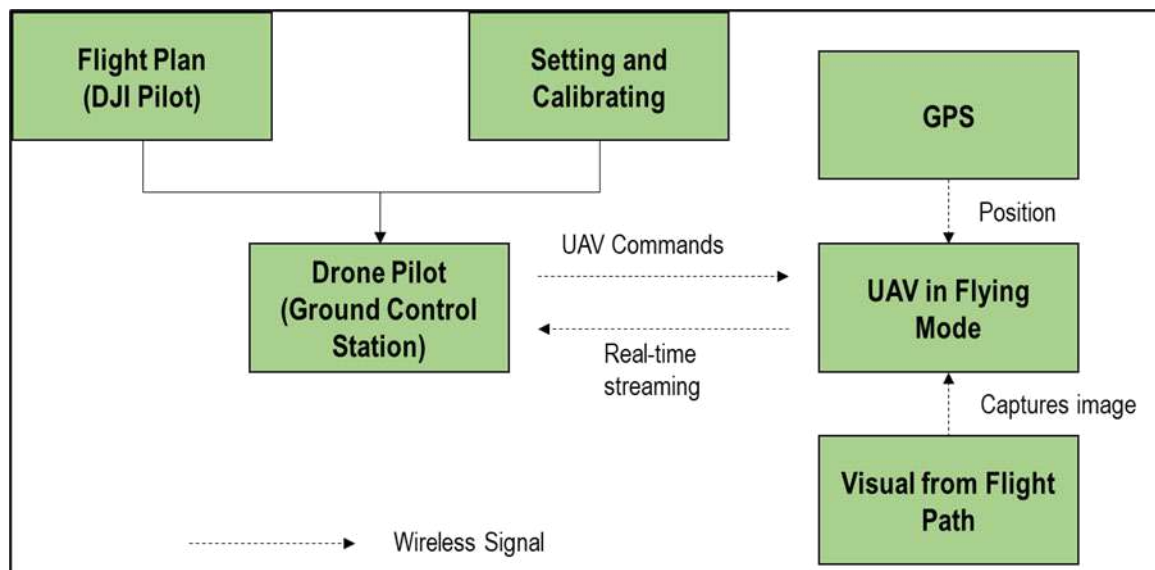


Figure 3-7 Process of UAV Image Capturing



Figure 3-8 RAW Sample Image taken in Meherpur Upazila



Figure 3-9: RAW Sample Image taken in Mujibnagar Upazila

3.2.4 UAV Image Processing by Photogrammetric Method

3.2.4.1 Aerial Triangulation

After capturing the images, it was processed to generate stereo model and to extract features for base map preparation. Aerial Triangulation is a complex process that requires **specialized software** and **expertise in photogrammetry**. **Photogrammetric software** was used for aerial triangulation. The tasks including Tie Point Generation, GCP Measure (collected GCP values are being incorporated in the images), Model Calibration.

Data Collection: Data preparation for aerial triangulation involved loading the UAV images into the photogrammetric workstation. Consultant always ensures that the significantly overlapped images which cover the entire project areas were loaded for the aerial triangulation.

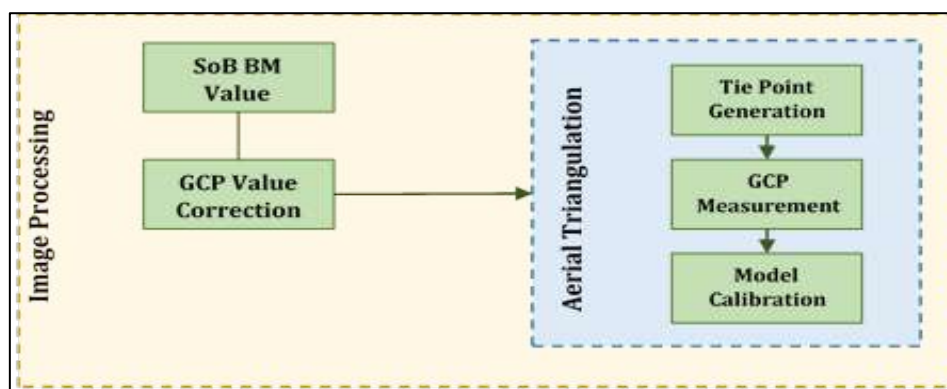


Figure 3-10: Process of image processing by using photogrammetric method

3.2.4.1.1 Tie Point Generation:

In this automatic matching of the common features (tie points) between the overlapping images. The processing software has software that will automatically identify and match common features between the overlapping images. By identifying and matching these tie points between images, the software will accurately determine the position and orientation of the camera, leading to precise 3D reconstruction.

Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

The initial image positioning, computed tie points positions, and exemplary image preview has been shown below-

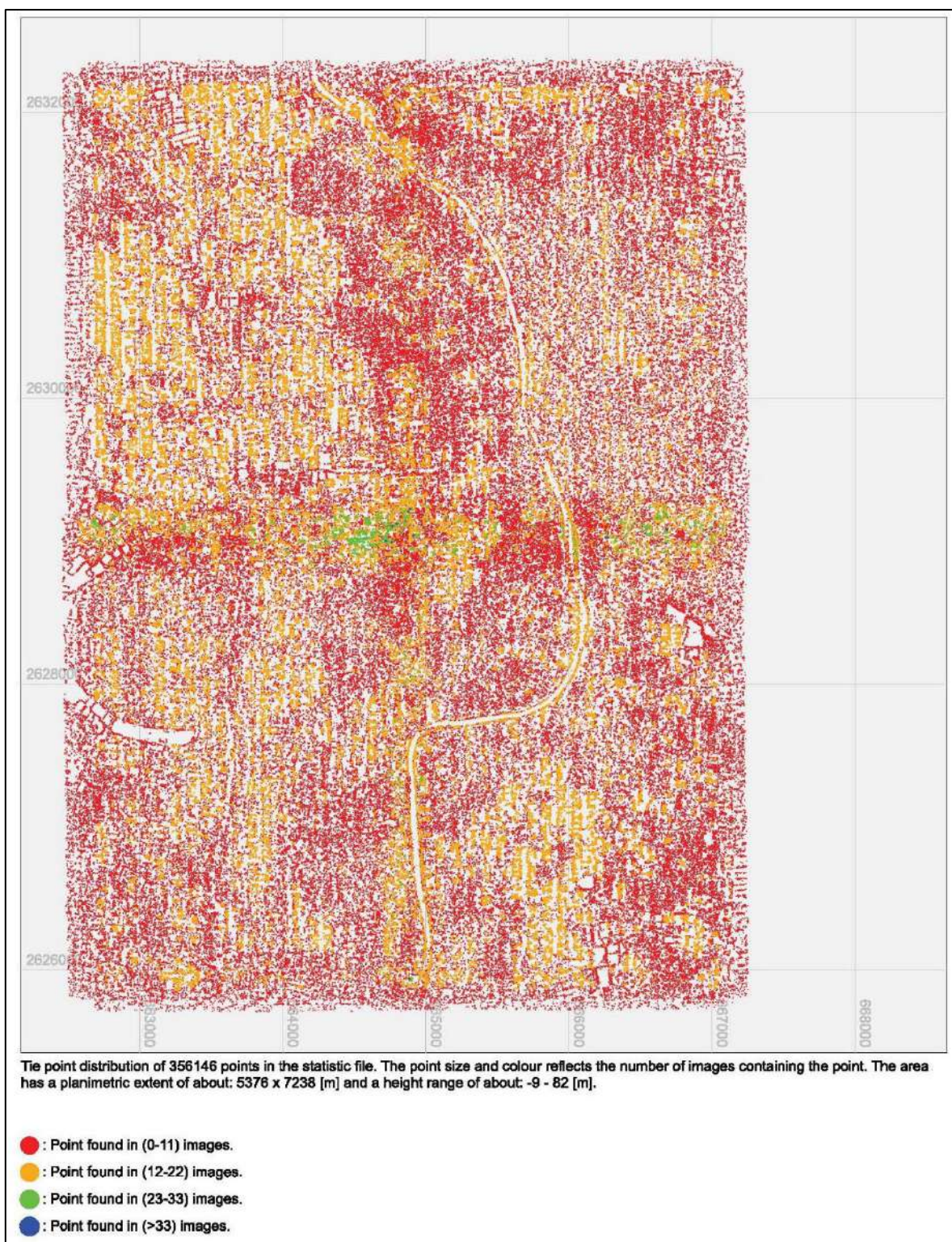


Figure 3-11: Methodological Sample of Tie Point Distribution (Meherpur Upazila)



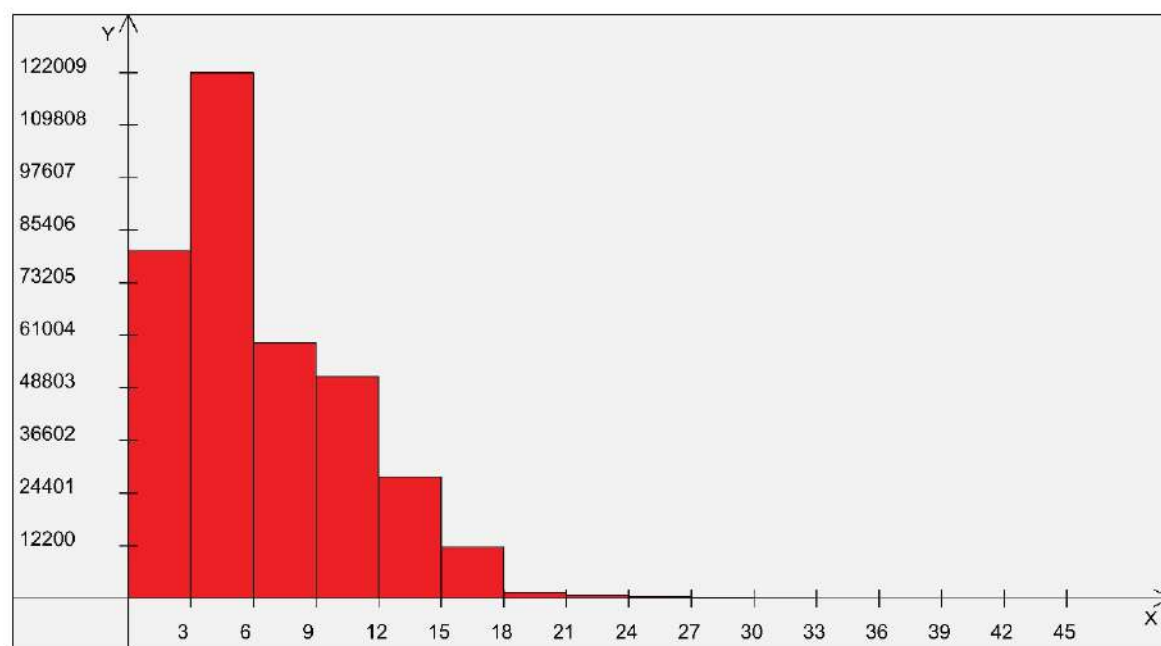
Image points

Frequency of image point observations in the photos

X	Number of image points (Y)	%
>0 - 3	80629	22.64
>3 - 6	122009	34.26
>6 - 9	59284	16.65
>9 - 12	51379	14.43
>12 - 15	28148	7.90
>15 - 18	11966	3.36
>18 - 21	1368	0.38
>21 - 24	743	0.21
>24 - 27	371	0.10
>27 - 30	173	0.05
>30 - 33	55	0.02
>33 - 36	13	0.00
>36 - 39	6	0.00
>39 - 42	1	0.00
>42 - 45	1	0.00

Appearance of 356146 image points from the statistic file. The table contains all image observations of the points.

Histogram for image point frequency in the photos



Graphic for 8027 photos and 356146 image points. Number of image points (Y) within a given range for number of photos (X).

Figure 3-12: Image Points and Histogram of Image Frequency in Reference to Figure 3-11.

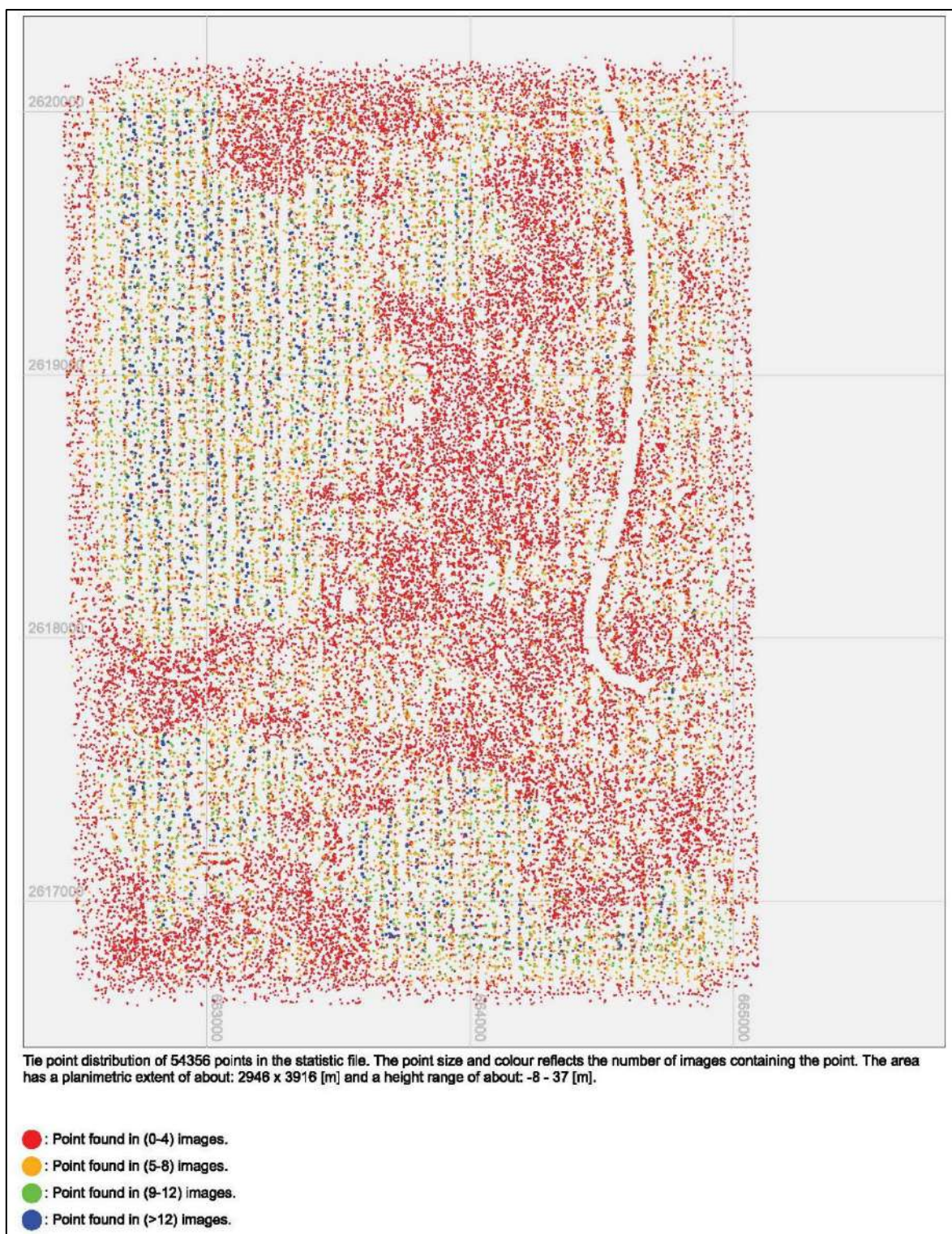


Figure 3-13: Methodological Sample of Tie Point Distribution (Mujibnagar Upazila)

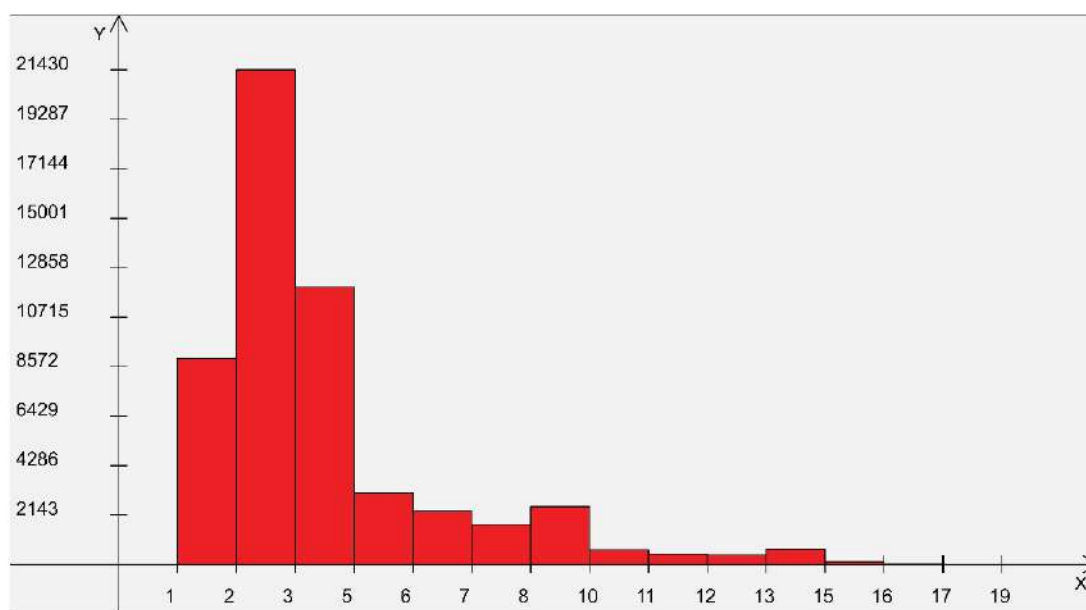
Image points

Frequency of image point observations in the photos

X	Number of image points (Y)	%
>0 - 1	0	0.00
>1 - 2	8922	16.41
>2 - 3	21430	39.43
>3 - 5	12026	22.12
>5 - 6	3090	5.68
>6 - 7	2319	4.27
>7 - 8	1744	3.21
>8 - 10	2513	4.62
>10 - 11	633	1.16
>11 - 12	445	0.82
>12 - 13	412	0.76
>13 - 15	662	1.22
>15 - 16	120	0.22
>16 - 17	35	0.06
>17 - 19	5	0.01

Appearance of 54356 image points from the statistic file. The table contains all image observations of the points.

Histogram for image point frequency in the photos



Graphic for 2006 photos and 54356 image points. Number of image points (Y) within a given range for number of photos (X).

Figure 3-14: Image Points and Histogram of Image Frequency in Reference to Figure 3-13.

3.2.4.1.2 Measurement of Ground Control Points:

Ground Control Points (GCPs) will play a crucial role in improving the accuracy of aerial triangulation and the overall quality of photogrammetric products derived from the UAV images. The GCPs which are marked and collected before drone survey were used as reference markers to help align and refine the result of the aerial triangulation process.

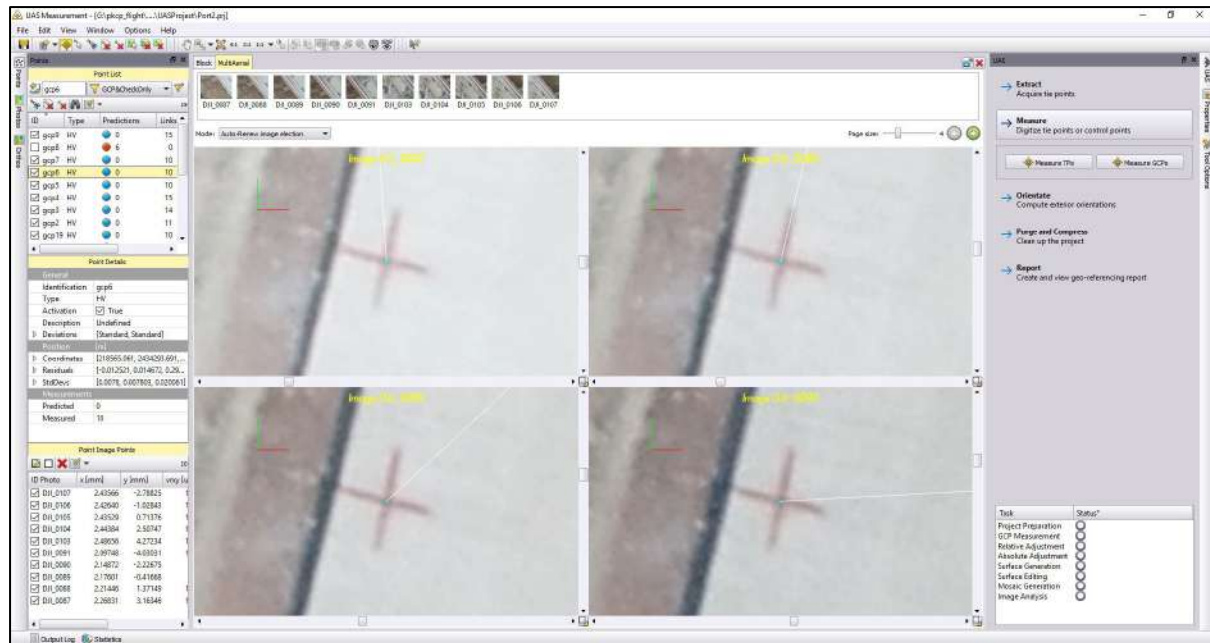


Figure 3-15: GCP Measurement in UAS Master for Image Processing

3.2.4.2 Generation of Orthophoto

After successful Aerial Triangulation, Orthophoto has been generated. Color balanced orthophoto was prepared for the entire area of each city corporation. Orthophoto generation is the process of assembling each rectified image to have a seamless mosaic. It would be done to get a better understanding of the existing situation of the project area. Mosaicking of orthophoto includes the following tasks,

- Seamline drawing involves drawing the boundary of the image delineating which part of the image would overlap to which image.
- Balancing of color and contrast withing different images

In the case of tile orthophoto, edge was rightly matched with respective side tiles. The resolution of orthophoto is 10cm.

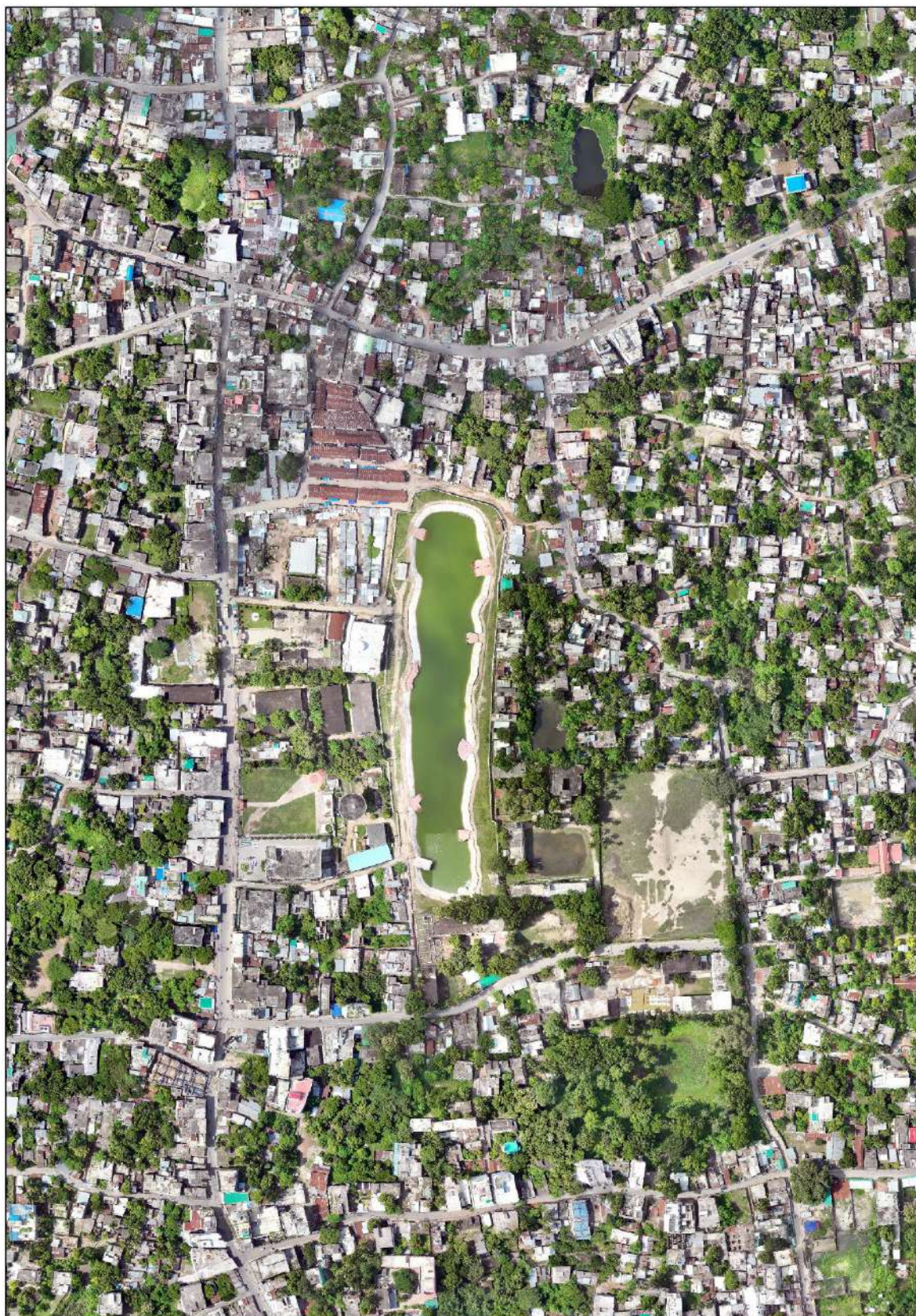


Figure 3-16: Sample Orthophoto of Meherpur Upazila (Survey Zone-BF)



Figure 3-17: Sample Orthophoto of Mujibnagar Upazila (Survey Zone-N)



Figure 3-18: Sample Orthophoto of Gangni Upazila

Chapter 4: 3D Feature Extraction and Database Preparation

4.1 3D Feature Extraction from Stereo Model

The **Aerial Triangulation** of UAV images, stereo model has been generated. From the generated stereo pair model, features were extracted by using this stereo model in **stereoscopic workstation** and stored in the geodatabase into different feature classes according to the database designed based on the survey format prescribed in the **ToR**. All features had z values in the vertex and all the permanent structures contain X, Y and Z value. The ground point of roadside corner for both side of road was also taken. All these features were stored in different GIS layers in geodatabase format.

Table 4-1: 3D vector data specification as per Terms of Reference (ToR)

Sl. No	Feature	Feature Type
1.	Road Double Line – Carriageway	Line
2.	Road Polygon – Carriageway	Polygon
3.	Structure - Roof	Polygon
4.	Water Body – River, Canal, Pond & Ditch - Edge	Line
5.	Embankment – Edge	Line
6.	Water Control Structure – Bridge, Culvert, Switch Gate	Line
7.	Boundary Wall - Top	Line

Source: Consultant, TILLER.

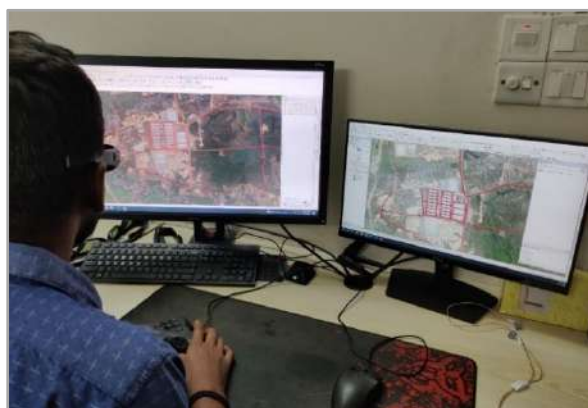


Figure 4-1: 3D Feature Extraction from stereo model using photogrammetric method



Table 4-2: Format for extracting and surveying of different types of physical features

Sl. No		Data Type			Z Value (Z measurement level)		
	Physical Feature Name	Point	Line	Polygon	On Top	On Ground/ level	Not Required
A. Water bodies							
1	1. River Edge		x	x		x	
2	2. Khal Edge		x	x		x	
3	3. Drainage Channels			x		x	
4	4. River/khal centerline		x			x	
5	5. Flow direction						x
6	6. Ponds/Tanks/Diches			x		x	
B. Building/Structure (Pucca / Semi pucca / stories, building area>15 sqm (Depending on map Scale)							
8	1. House			x	x		
9	2. Industry			x	x		
10	3. Commercial			x	x		
11	4. Mixed			x	x		
12	5. Boundary Wall		x		x		
C. Roads							
13	1. Road Pucca		x	x		x	
14	2. Road HBB		x	x		x	
15	3. Road Katcha		x	x		x	
16	4. Path Pucca		x	x		x	
17	5. Path Katcha		x	x		x	
18	6. Traffic Island/		x	x		x	
	Divider						
19	8. Road/Path Centerline		x			x	
D. Railways							
20	1. Railway Row Line		x			x	



21	2. Railway centerline		X			X	
22	3. Railway Junction Points	X				X	
E. Other Structure and Flood works (Length, width, condition of abutments and wing-walls)							
23	1. Bridge / Culverts			X	X		
24	2. Embankments			X	X		
25	3. Pump Station for Flood			X		X	
26	4. Sluice Gates		X		X		
27	5. Bus/Trucks Terminals			X		X	
28	Bathing/boat Jetty		X		X		
F. Natural Features							
29	1. Forest			X	X		
30	2. Group of trees			X	X		
31	3. Group of Trees Point	X			X		
32	4. Wetlands / Bog/ Marshland/ Flood prone area			X		X	
33	5. Sand/Sand Dunes			X		X	
34	Significant Single Tree	X				X	
E. Utility Services							
35	1. High voltage Electric Line		X		X		
36	2. Telephone Line		X		X		
37	3. Gas Line		X			X	
38	4. Utility Substation	X				X	
39	5. Overhead Water Tank			X	X		



40	4. Waste disposal and treatment points	x				x	
41	3. Water work			x		x	
42	5. Deep Tube well	x				x	
	Stations						
F. Area Polygon							
43	Residential Area			x		x	
44	Commercial Area			x		x	
	Institutional,						
45	Educational, Health Govt office			x		x	
46	Industrial (as classified by acts and rules)			x		x	
47	Agricultural Area			x		x	
48	Recreation / sports			x		x	
49	Religious / cemetery			x		x	
49	Graveyard. Cemetery			x		x	
51	Historic Place			x		x	
52	Borrow Pits			x		x	
53	Vacant Land			x		x	
54	Public gathering			x		x	
55	Garden			x		x	
56	Disaster prone areas			x		x	

Source: Consultant, TILLER.

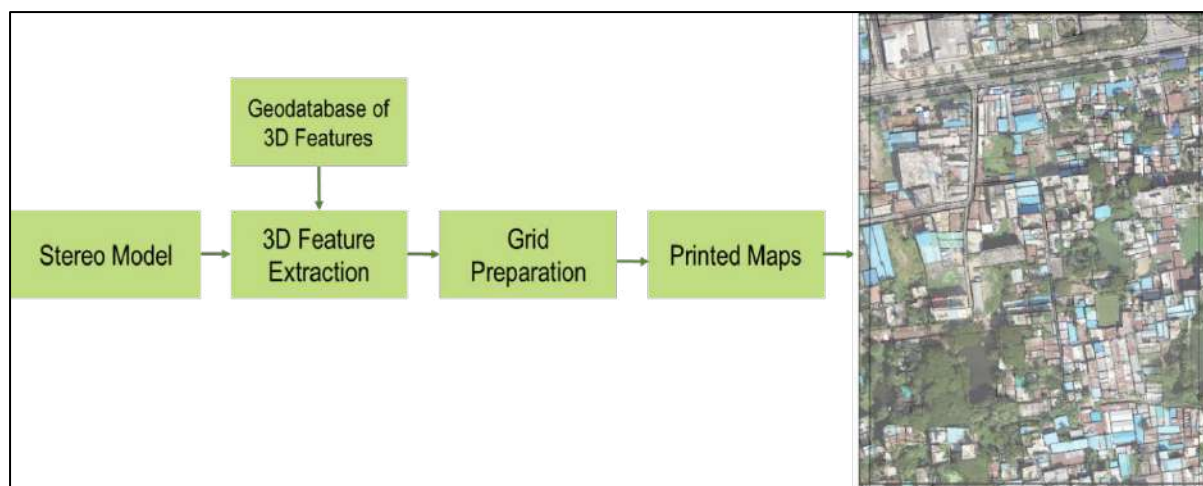


Figure 4-2: 3D Feature Extraction Process

4.2 Extracted 3D Features

The extracted features were processed using drone mapping software to create 3D maps, 2D maps, digital elevation models, from which highly accurate measurements and volumetric calculations were taken.

4.3 3D Features Meherpur Sadar Upazila

The total area surveyed was 264.03 Sq.km.

The total digitized area is presented in Table 4.3. In Meherpur Sadar Upazila, there are a total of 195,020 structures, and all of them have been 3D digitized.

The road network has been categorized into four major types. These are i) Bituminous Carpeting Concrete (BCC); ii) Reinforced Cement Concrete (RCC)/Cement Concrete (CC); iii) Herring-Bone-Bond (HBB); and iv) Earthen roads. The total road length within the surveyed area of Meherpur Sadar Upazila stands at 917.97 Km. Among these, BCC roads constitute the highest portion, with a total length of 408.90 Km. Earthen roads are also significant in number and cover around 323.16 Km, which are mostly found in the peripheral or less developed rural unions of the Upazila. HBB roads span 140.93 Km, serving as connectors in semi-urban or transitional areas. RCC/CC roads, often representing recently upgraded or heavily used urban links, comprise 44.98 Km of the total network.

Apart from roads, key physical features such as waterbodies have also been mapped. Rivers and canals run through the area with a cumulative length of 80.24 Km. In addition, a total of 3,280 ditches and ponds have been identified, covering a combined surface area of 8.06 Sq.Km. These water features are critical in maintaining local hydrology and are integral to both agriculture and stormwater management systems in the Upazila.

Table 4-3: Different structures and infrastructures extracted from Meherpur Sadar Upazila

Description	Unit	Quantity
Physical Features		
Structure	Nos.	195,020



Transportation (Road & Railway)		
Bituminous Carpeting Concrete (BCC)	Km	408.9
Reinforced Cement Concrete (RCC)/ Cement Concrete (CC)	Km	44.98
Herring-Bone-Bond (HBB)	Km	140.93
Earthen	Km	323.16
Waterbodies		
River & Canal (Length)	Km	80.24
Ditch and Pond	Nos.	3,280
Ditch and Pond (Area)	Sq.Km	8.06

Source: UAV Survey, 2025.

4.4 3D Features of Mujibnagar Upazila

The total area surveyed was 113.92 Sq.km.

The 3D digitization for Mujibnagar Upazila was conducted using high-resolution UAV orthophotos, ensuring accurate extraction and classification of existing physical features. A wide array of land cover and infrastructure elements were digitized, contributing to a comprehensive spatial representation of the upazila. A total of 68,562 structures were identified and mapped, indicating dense built-up areas in some unions.

The road network was categorized by surface type. Among them, 153.21 km of Bituminous Carpeting Concrete (BCC) roads were detected, followed by 55.02 km of Herring-Bone-Bond (HBB) roads and 66.10 km of Earthen roads, which dominate the rural transportation infrastructure. Additionally, 11.43 km of Reinforced Cement Concrete (RCC) or Cement Concrete (CC) roads were digitized, mostly concentrated around semi-urban growth centers and bazaars.

Waterbodies were also carefully digitized. The survey mapped 638 ponds and ditches, covering a cumulative area of 1.03 square kilometers. Major linear water features, such as rivers and canals, extend over a total length of 45.95 km.

Table 4-4: Different structures and infrastructures extracted from Mujibnagar Upazila

Description	Unit	Quantity
Physical Features		
Structure	Nos.	68,562
Transportation (Road & Railway)		



Bituminous Carpeting Concrete (BCC)	Km	153.21
Reinforced Cement Concrete (RCC)/ Cement Concrete (CC)	Km	11.43
Herring-Bone-Bond (HBB)	Km	55.02
Earthen	Km	66.1
Waterbodies		
River & Canal (Length)	Km	45.95
Ditch and Pond	Nos.	638
Ditch and Pond (Area)	Sq.Km	1.03

Source: UAV Survey, 2025.

4.5 3D features of Gangni Upazila

The total area surveyed was 340.35 Sq.km.

The base map data preparation for Gangni Upazila involved the digitization of key physical features extracted from the high-resolution UAV orthophotos. A total of 273,453 structures were identified across the upazila. This extensive mapping provides critical insight into the settlement pattern and spatial distribution of population clusters.

The road infrastructure was mapped and categorized by total area, with 3.36 square kilometers of roads digitized. This includes all visible road types—paved, unpaved, and internal access roads—forming a comprehensive transportation network across the upazila.

Hydrological features were also meticulously recorded. A cumulative 9.44 square kilometers of waterbody area was digitized, encompassing ponds, canals, and other surface water features that play a key role in local agriculture, irrigation, and aquaculture.

Additionally, 257 bridges and culverts were identified and mapped as part of the water control infrastructure.

Table 4-5: Different structures and infrastructures extracted from Gangni Upazila

Description	Unit	Quantity
Physical Features		
Structure	Nos.	273,453
Transportation (Road & Railway)		
Road (Area)	Sq.Km	3.36
Waterbodies		
Waterbody (Area)	Sq.Km	9.44



Water Control Structures		
Bridge, Culvert	Nos.	257

Source: *UAV Survey, 2025.*



Chapter 5: Concluding Remarks

The UAV image capture, processing, geo-referencing, 3D digitization, and digitized database preparation have been successfully carried out as part of the “Preparation of Development Plan for Meherpur Zilla.” This initiative has produced a high-resolution, spatially accurate, and GIS-compatible database that comprehensively covers Meherpur Sadar, Mujibnagar, and Gangni upazilas.

A total of 462 UAV flight blocks were executed, supported by 1,836 precisely measured Ground Control Points (GCPs), enabling the generation of orthophotos and 3D models with a high degree of accuracy. Using advanced photogrammetric techniques, physical and topographic features—including roads, buildings, water bodies, and vegetation—were extracted and digitized into a robust spatial database.

This base map and 3D digital dataset form a critical part of the overall planning process and will serve as a core reference for spatial analysis and informed decision-making under the broader development plan. The outputs of this phase establish a reliable foundation for the subsequent formulation of the Structure Plan, Urban Area Plan, and Rural Area Plan for Meherpur Zilla.