No.

The People's Republic of Bangladesh
Survey of Bangladesh (SOB)

BANGLADESH DIGITAL MAPPING ASSISTANCE PROJECT (BDMAP)

Final Report

September 2013

Japan International Cooperation Agency (JICA)

Asia Air Survey Co., Ltd.
Aero Asahi Corporation

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JR
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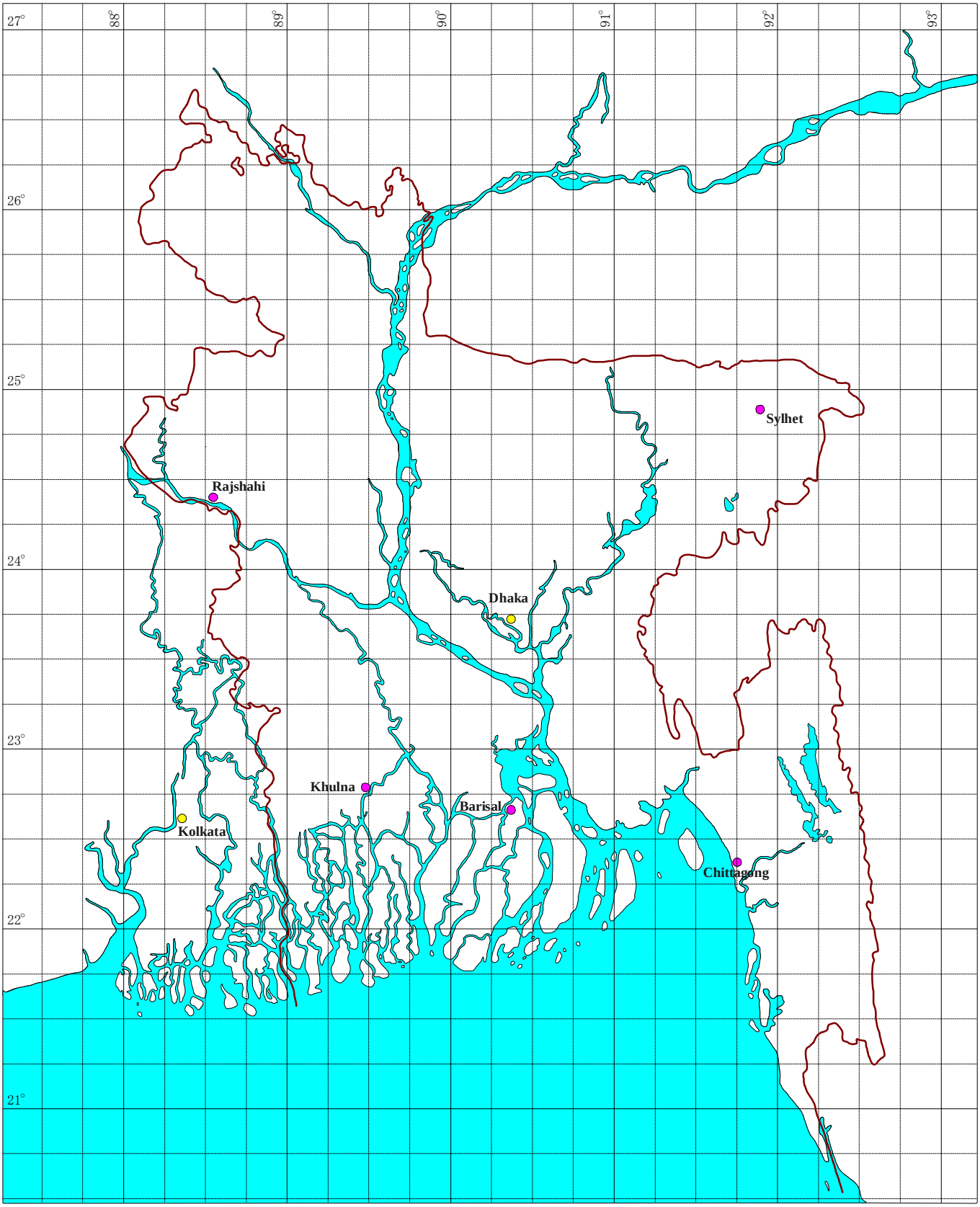
Exchange Rate

US$1 = Yen98.1

BDT1=Yen1.280

As of August 2013

Location Map



1:50,000 scale existingtopographic map sheet

Scale Bar

0 20 40 60 80 100 km

International boundary

Target 5 cities for 1:5,000 scale digital topographic mapping:

Chittagong, Barisal, Khulna, Sylhet, Rajshahi

List of Abbreviations

ASEAN	Association of Southeast Asian Nations
BDMAP	Bangladesh Digital Mapping Assistance Project
BM	Bench Mark
Brig. General	Brigadier General
Col.	Colonel
DEM	Digital Elevation Model
DRGA	Debit Relief Grant Assistance
EVM	Earned Value Management
ERD	Economic Relation Division, Ministry of Finance
GCP	Ground Control Point
GIS	Geographic Information System
GSI	Geological Survey Institute
IDMS	Improvement of Digital Mapping System
JCC	Joint Coordination Committee
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
Lt. Col.	Lieutenant Colonel
MOD	Ministry of Defense
OJT	On the Job Training
OS	Operation System
PDM	Project Design Matrix
PV	Planed Value
QC	Quality Control
R/D	Record of Discussion
SAC	Schedule at Completion
SOB	Survey of Bangladesh
SPI	Schedule Performance Index
Tk	Taka
U.S.A.	Unite States of America
UPS	Uninterruptible Power System
2D	2 Dimensions
5K	5,000

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Chapter 1 Outline of the Project

Chapter 1 Outline of the Project

The outline of BDMAP and IDMS are as follows:

1.1 Background of the Project

Survey and mapping in Bengal Region was started by the Survey of India under the British rule. After the independence of Bangladesh from Pakistan, a regional office of the Survey of Pakistan for East Pakistan was reorganized as Survey of Bangladesh (SOB). Due to the reason of a history in survey and mapping in Bangladesh, following problems were the bottlenecks of survey and mapping in Bengal Region.

1) No geodetic datum point in Bangladesh
2) Geodetic control points were not distributed homogeneously.
3) Leveling network was divided into two parts by the Padma River.

The first Japanese technical cooperation program in the field of survey and mapping in Bangladesh was the topographic mapping and bathymetric survey for the construction of Megna Bridge at the several years after the independence of Bangladesh.

After that, the Government of Japan has executed following technical cooperation programs continuously to Survey of Bangladesh.

1) Feasibility study on establishing national geodetic network
2) Installation of advanced map printing equipment
3) The study on urban information management for greater Dhaka City
4) Dispatching long term and short term experts
5) Geographic and mapping training in Japan

The present 1:50,000 scale national base maps covering whole territory of Bangladesh has been prepared at approximately 60～70 years ago, and were not updated excepting partial updating.

Considering the increase of demands of new maps, the Government of Bangladesh decided to prepare new 1:25,000 scale digital topographic maps covering whole territory Bangladesh and 1:5,000 scale digital topographic maps covering 5 major cities (Improvement of Digital Mapping System in Bangladesh: IDMS) using DRGA fund.

The Government of Japan decided to support this Project on a technical aspect and also

planning and management aspects, and technical cooperation program "Bangladesh Digital Mapping Assistance Project (BDMAP)" was started from August 2009.

1.2 Project purpose and outputs

The overall goal and project purpose of "Bangladesh Digital Mapping Assistance Project" (BDMAP) is set down as follows. The details of BDMAP are shown in Appendix 3.1 "PDM of BDMAP (Version 0.1, 24 November 2008), Appendix 3.2 "PDM of BDMAP (Version 2.0, August 2009)", Appendix 3.3 "PDM of BDMAP (Version 3.0, 23 November 2011)" and Appendix 3.4 "PDM of BDMAP (Version 4.0, 27 March 2012)".

1.2.1 Overall goal

SOB implements the Project of "Improvement of Digital Mapping System of Survey of Bangladesh" (IDMS: 1:25,000 scale digital topographic mapping covering whole Bangladesh territory and 1:5,000 scale digital topographic mapping at major 5 cities).

1.2.2 Project purpose

Technical staff of SOB will develop their skills enough to implement the digital mapping in the scale of 1:5,000 and 1:25,000 of IDMS.

1.3 Project site

The project sites of IDMS are as follows:

1) 1:25,000 scale digital topographic mapping area
   Whole Bangladesh territory: Approximately 144,000 km^2

2) 1:5,000 scale digital topographic mapping area
   Major 5 cities

Sylhet	178 km^2
Rajshahi	185 km^2
Chittagong	575 km^2
Khulna	329 km^2
Barisal	148 km^2
Total	1,417 km^2

1.4 Project implementation system

The project implementation system of BDMAP and IDMS is shown in Figure 1.4.1 “Implementation Structure of BDMAP and IDMS”.

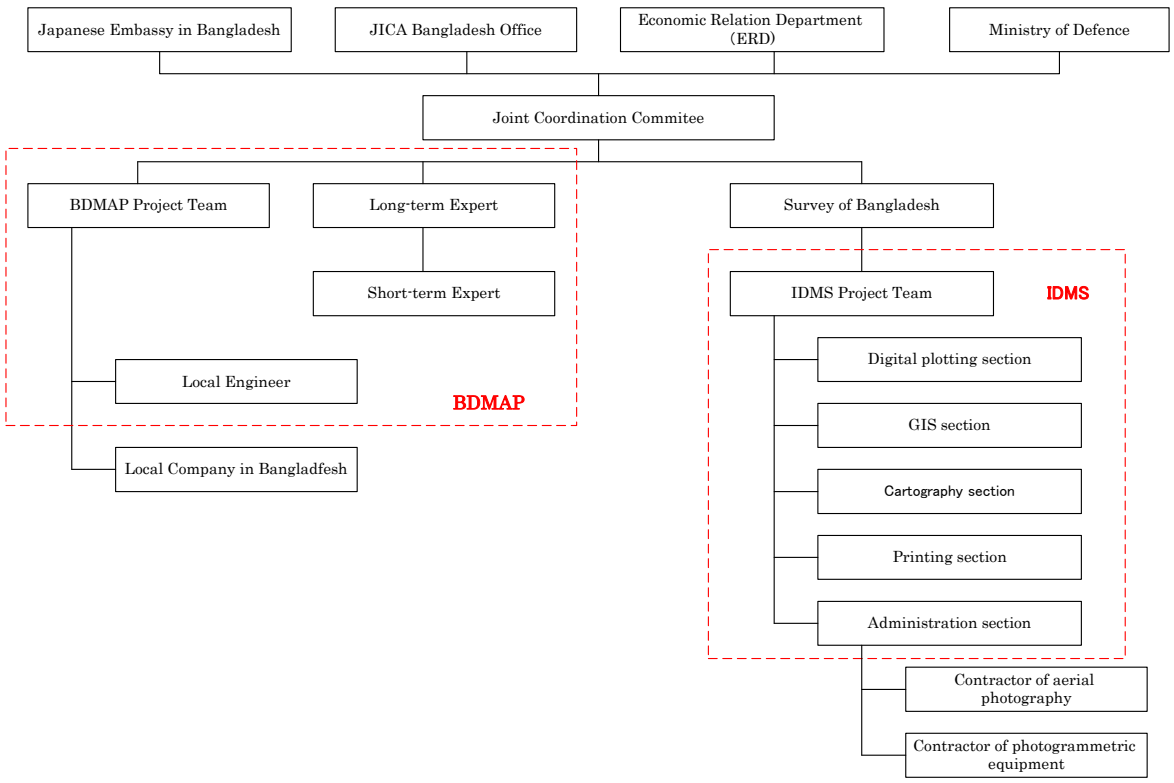

Figure 1.4.1 Implementation structure of BDMAP and IDMS

1.5 Points to be considered at the implementation of the Project

The target of IDMS is to produce 1:25,000 and 1:5,000 scale digital topographic mapping by SOB, and the target of BDMAP is to support the activities of SOB for the smooth implementation of IDMS by SOB.

Therefore, IDMS and BDMAP have a close relationship with each other, and the schedule and activities of BDMAP has to be modified according to the progress of IDMS flexibly.

Especially, the schedule of procurement of photogrammetric equipment and software, aerial photography and renovation of working space has a great impact to the work schedule and activities of BDMAP.

Therefore, during implementation of BDMAP, it is necessary to check and to monitor the progress of IDMS always, and to modify the schedule and activities of BDMAP to meet the change of the progress and schedule of IDMS.

In case of a big project such as IDMS, many issues will be arisen during the implementation of the project and it is necessary to solve the issues immediately to minimize the delay of schedule of the project.

Generally, it is difficult to execute the project on schedule. Therefore, checking and monitoring of the progress of the project and early trouble shooting are the important factors for the implementation of the project.

Chapter 2 Outline of the Activities and Outputs of BDMAP (4th Year)

Chapter 2 Outline of the Activities and Outputs of BDMAP (4th Year)

Outline of the activities and outputs of BDMAP (4th year) are as follows:

2.1 Outline of the activities of BDMAP (4th year)

The basic technique and knowledge of digital photogrammetric mapping were already transferred to the staff of SOB during the period from the 1st year to the 3rd year of BDMAP.

Therefore, the main activities of the 4th year of BDMAP were to support the planning, progress management, accuracy and quality control of IDMS, and technical troubleshooting during the implementation of actual work of IDMS.

2.1.1 Planning and management

The project planning and management necessary for the implementation of actual works of digital photogrammetric mapping such as how to make a execution plan, how to prepare the work schedule, how to manage the works and so on were transferred to the staff of SOB by OJT during the 4th year of BDMAP.

2.1.2 Accuracy and quality control

During the 4th year of BDMAP, technical transfer to the accuracy and quality control on aerial triangulation, digital plotting, GIS basic data production and digital cartography was executed to the staff of SOB by OJT.

2.1.3 Progress management

The OJT on the progress management was executed to the staff of SOB in the 4th year of BDMAP.

The main purpose of OJT of progress management was not only to grasp the situation of work progress, but also to analyze the reasons of issues such as repetition of same mistakes, delay of works and to find out the countermeasures not to occur the same mistakes and issues.

2.1.4 Technical troubleshooting

Concerning the technical issues which were not able to be solved by the staff of SOB

themselves during the implementation of actual work of digital photogrammetric mapping, a technical suggestion and/or method of settlement were made by BDMAP.

To build up the technical capability of the staff of SOB, it is necessary to solve the issues by the staff of SOB themselves as much as possible. Therefore, in the 4th year of BDMAP, only suggestion and method of settlement to the issues were made by BDMAP, and to employ the suggestion and method of settlement made by BDMAP was left to the judgment of the staff of SOB.

2.1.5 Map inspection

For a new activity of the 4th year of BDMAP, inspection method of the digital topographic map and data was transferred to the staff of SOB.

The inspection method which was executed up to present by SOB is the method for inspection of analogue map. Therefore, it is impossible to apply the traditional inspection method of SOB to the digital topographic map and data.

Accordingly, it is necessary to establish the suitable structure for map and data inspection in SOB, and also it is necessary to inspect the data at each stage of digital photogrammetric mapping procedure such as, digital plotting data, GIS basic data and digital topographic data.

2.1.6 Technical transfer of map revision survey

From around the end of November 2012, pilot project for revision survey of 1:5,000 scale Dhaka map was started by the staff of SOB under the instruction of BDMAP. The purposes of this pilot project are as follows:

1) To understand the methodology of revision survey of digital topographic maps
2) To understand how to make a revision survey plan
3) To examine the contents of works necessary for the revision of 1:5,000 scale Dhaka digital map
4) To execute the actual work of revision survey on pilot project area
5) To summarize the methodology and issues found through the implementation of pilot project

For a pilot project of revision survey of digital topographic maps, “Aftab Nagar Area”, which is under housing land development, locating east-south direction from Gulshan Area was selected.

2.1.7 Field identification

Based on the issues found on the field identification which were executed during the 3rd year of BDMAP, technical suggestions concerning methodology of field identification, especially, how to assemble the data which were collected in the filed were given to the staff of SOB.

2.1.8 Revision of operation manual

The operation manuals for digital photogrammetric mapping were prepared during the period from the 1st to the 3rd year of BDMAP. However, during the implementation of actual digital photogrammetric mapping work of IDMS, as might be expected, BDMAP and IDMS encountered following issues.

1) Issues which were not expected before starting the actual work
2) Troubles on the operation of works

Through the implementation of actual work of digital photogrammetric mapping of IDMS, these issues and troubles were solved by the staff of SOB and BDMAP, and the operation manuals, which were prepared during the past three years of BDMAP, were modified if necessary.

From now on, new issues and troubles may be occurred through the implementation of actual work of digital photogrammetric mapping of IDMS, and it is necessary to modify the operation manuals on a case-by-case basis.

2.1.9 20 years anniversary party for technical cooperation between JICA and SOB

Considering the present social situation of Bangladesh, “20 Years Anniversary Party for Technical Cooperation between JICA and SOB” was held on the evening of 26 August 2013 instead of a seminar at daytime. Details of this anniversary party are described in Chapter 4 “JCC and Seminar”.

2.1.10 Support for supplemental terminal evaluation

The supplemental terminal evaluation of BDMAP was executed on 26 June 2013 by JICA Bangladesh Office. BDMAP supported the activities of supplemental terminal evaluation by JICA Bangladesh Office and the following necessary information and data were prepared by BDMAP.

1) Progress of IDMS at the end of May 2013

2) Productivity of IDMS (the value of SPI)
3) Analysis of work period based on the productivity of IDMS
4) Accuracy of data acquisition

The outline of supplemental terminal evaluation of BDMAP is described in Chapter 4 "JCC and Seminar".

2.1.11 Preparation of final report

At the end of the activities of the 4th year of BDMAP, the final report on "Bangladesh Digital Mapping Assistance Project (4th Year)" was prepared by BDMAP and explained to SOB.

2.1.12 Other activities

To prepare the digital topographic maps, not only the technique and knowledge for ground survey and computer operation of photogrammetric mapping, but also the wide knowledge and experience such as statistics theory, theory of error, knowledge of natural science such as geology and geomorphology, oceanography, and also a talent for drawing are necessary.

However, many staff of SOB does not have such a wide knowledge and experience. Therefore, following textbooks were prepared for the purpose of build up of the knowledge of the staff of SOB during the period of the 4th year of BDMAP.

These textbook were prepared to be used for the training to the staff of SOB by SOB itself.

1) Introduction of Topography
2) Textbook for Revision Survey of Digital Topographic Map
3) Characteristics of Building Shape on Orthophoto
4) Image on Orthophoto (Shape and Image of Artificial Features on Orthophoto)
5) Interpretation of Spot Image

2.2 Outline of the outputs of BDMAP (4th year)

The outline of the outputs of BDMP (4th year) are as follows:

2.2.1 Report

1) Plan of Operation for Bangladesh Digital Mapping Assistance Project (4th Year), June 2012
2) Bangladesh Digital Mapping Assistance Project (4th Year), Final Report,

September 2013

2.2.2 Operation manual (modified version)

1) Operation manual for aerial triangulation
2) Operation manual for DEM extraction
3) Operation manual for orthophoto generation
4) Operation manual for orthophoto mosaic
5) Operation manual of digital plotting
6) Operation manual of digital compilation
7) Introduction for "GIS basic data" (Spatial data framework)

2.2.3 Textbook (new)

1) Textbook on digital compilation for 1:25,000 and 1:5,000 scale digital map, June 2012
2) Textbook on digital compilation for 1:5,000 scale digital maps, June 2012
3) Introduction of topography, November 2012
4) Textbook for revision survey of digital topographic maps, November 2012

2.2.4 Other documents

1) Pilot project on revision survey of Dhaka 5K map, July 2013
2) Activity report of JICA expert GIS data management, 29 October 2012
3) Inspection results of 1:25,000 scale digital topographic maps, February 2013
4) Issues on digital plotting, February 2013
5) Image on orthophoto (Shape and image of artificial features on orthophoto), January 2013
6) Characteristics of building shape on orthophoto, January 2013
7) Interpretation of Spot Image (Image comparison between orthophoto and Spot Image), February 2013

2.3 Outline of the outputs of IDMS (4th year)

The main purpose of the activities of BDMAP was to support the activities of IDMS (1:25,000 and 1:5,000 scale digital topographic mapping) from the technical, planning and management aspects.

Therefore, it is considered that the outputs of BDMAP will be expressed on the outputs of IDMS, especially the production of 1:25,000 and 1:5,000 scale digital topographic maps and the accuracies of these digital topographic maps.

The Production of digital topographic maps production by IDMS as of the end of July 2013 is described below.

Based on the order from the Government of Bangladesh, SOB decided to give top priority to the production of 1:25,000 scale digital topographic maps of Block-7.

Therefore, 1:5,000 scale digital topographic mapping was suspended from November 2012 for a certain time, and digital plotting section put an available manpower and equipment of digital plotting section into 1:25,000 scale digital plotting work of Block-7 from November 2012.

Therefore, the production of 1:5,000 scale digital topographic maps was delayed from the original schedule.

However, such a request from the Government of Bangladesh means that the existence value of IDMS was recognized by the stakeholders. Also, it is recommended that SOB will accept such a request from the Government of Bangladesh as much as possible.

2.3.1 Aerial triangulation

From around May 2011, aerial triangulation of Block-4 was started by the aerial triangulation unit of IDMS. The production of aerial triangulation as of the end of July 2013 is shown in Table 2.3.1 “Production of aerial triangulation as of the end of July 2013”.

Table 2.3.1 Production of aerial triangulation as of the end of July 2013

Aerial Triangulation (1:25,000 scale digital mapping)			Aerial Triangulation (1:5,000 scale digital mapping)		
Block No.	Model	Production	City Name	Model	Production
Block-1	855	855 finished	Sylhet	75	75 finished
Block-2	985	985 finished	Rajshahi	74	74 finished
Block-3	1,073	966 finished	Chittagong	226	Not yet
Block-4	566	566 finished	Khulna	133	Not yet
Block-5	262	2,626 finished	Barisal	70	Not yet
Block-6	1,343	1,209 finished			
Block-7	833	833 finished			
Block-8	991	496 finished			
Block-9	1,050	Not yet			
Block-10	984	492 finished			
Block-11	1,014	Not yet			
Block-12	715	Not yet			
Block-13	591	Not yet			
Total	11,262	6,664 finished	Total	578	149 finished

Note: 1) The value of model is an approximate value.

Accordingly, the executing rate of aerial triangulation as of the end of July 2013 is as follows:

1) The executing rate of aerial triangulation for 1:25,000 scale digital mapping
   Approx. 6,664 models ÷ 11,262 models = 0.591 Approx. 59.1 %

2) The executing rate of aerial triangulation for 1:5,000 scale digital mapping
   Approx. 149 models ÷ 11,262 models = 0.257 Approx. 25.7 %

2.3.2 Digital plotting

From the end of July 2011, digital plotting for 1:25,000 scale digital photogrammetric mapping of Block-4 was started, and digital plotting for 1:5,000 scale digital photogrammetric mapping of Sylhet City was started from February 2012 by digital plotting unit of IDMS.

The production of 1:25,000 and 1:5,000 scale digital plotting as of the end of July 2013 is shown in Table 2.3.2 "Production of digital plotting as of the end of July 2013".

Table 2.3.2 Production of digital plotting as of the end of July 2013

1:25,000 Scale Digital Plotting			1:5,000 Scale Digital Plotting		
Block No.	Area (km^2)	Production	City Name	Area (km^2)	Production
Block-1	16,275	14,184 finished	Sylhet	178	12.5 finished
Block-2	11,340	761 finished	Rajshahi	185	Not yet
Block-3	11,953	1,356 finished	Chittagong	575	Not yet
Block-4	8,908	8,353 finished	Khulna	329	Not yet
Block-5	5,300	Not yet	Barisal	148	Not yet
Block-6	16,885	Not yet			
Block-7	10,658	4,375 finished			
Block-8	12,461	Not yet			
Block-9	12,410	Not yet			
Block-10	9,063	Not yet			
Block-11	7,675	Not yet			
Block-12	11,989	Not yet			
Block-13	9,083	Not yet			
Total	144,000	29,029 finished	Total	1,417	12.5 finished

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.
2) The value of "Area (km^2)" is an approximate value.
3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of digital plotting as of the end of July 2013 is as follows:

1) The executing rate of 1:25,000 scale digital plotting
   Approx. 28,854 km^2 ÷ 144,000 km^2 = 0.202 Approx. 20.2 %

2) The executing rate of 1:5,000 scale digital plotting
Approx. 12.5 km^2 ÷ 1,417 km^2 = 0.009 Approx. 0.9 %

2.3.3 DEM

From the end of July 2011, DEM production of Block-4 was started by DEM unit of IDMS.

The production of DEM as of the end of July 2013 is shown in Table 2.3.3 "Production of DEM as of the end of July 2013".

Table 2.3.3 Production of DEM as of the end of July 2013

1:25,000 Scale DEM Production			1:5,000 Scale DEM Production		
Block No.	Area (km^2)	Production	City Name	Area (km^2)	Production
Block-1	16,275	Not yet	Sylhet	178	Not yet
Block-2	11,340	Not yet	Rajshahi	185	Not yet
Block-3	11,953	Not yet	Chittagong	575	Not yet
Block-4	8,908	3,570 finished	Khulna	329	Not yet
Block-5	5,300	Not yet	Barisal	148	Not yet
Block-6	16,885	Not yet			
Block-7	10,658	Not yet			
Block-8	12,461	Not yet			
Block-9	12,410	Not yet			
Block-10	9,063	Not yet			
Block-11	7,675	Not yet			
Block-12	11,989	Not yet			
Block-13	9,083	Not yet			
Total	144,000	3,570 finished	Total	1,417	0

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.
2) The value of "Area (km^2)" is an approximate value.
3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of DEM production as of the end of July 2013 is as follows:

1) The executing rate of 1:25,000 scale DEM production
Approx. 3,570 km^2 ÷ 144,000 km^2 = 0.025 Approx. 2.5%

2) The executing rate of 1:5,000 scale DEM production
The 1:5,000 scale DEM production is not yet started as of the end of July 2013.

2.3.4 Simple orthophoto

From the end of July 2011, the production of simple orthophoto based on the aerial triangulation data, for the usage of field identification, of Block-4 was started by orthophoto unit of IDMS.

The exact orthophoto using DEM data will be prepared after the completion of DEM production.

The production of simple orthophoto as of the end of July 2013 is shown in Table 2.3.4 "Production of simple orthophoto as of the end of July 2013".

Table 2.3.4 Production of simple orthophoto as of the end of July 2013

1:25,000 Scale Simple Orthophoto Production			1:5,000 Scale Simple Orthophoto Production		
Block No.	Area (km^2)	Production	City Name	Area (km^2)	Production
Block-1	16,275	8,050 finished	Sylhet	178	12.5 finished
Block-2	11,340	Not yet	Rajshahi	185	Not yet
Block-3	11,953	Not yet	Chittagong	575	Not yet
Block-4	8,908	7,700 finished	Khulna	329	Not yet
Block-5	5,300	Not yet	Barisal	148	Not yet
Block-6	16,885	Not yet			
Block-7	10,658	4,375 finished			
Block-8	12,461	Not yet			
Block-9	12,410	Not yet			
Block-10	9,063	Not yet			
Block-11	7,675	Not yet			
Block-12	11,989	Not yet			
Block-13	9,083	Not yet			
Total	144,000	20,125 finished	Total	1,417	12.5 finished

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.
2) The value of "Area (km^2)" is an approximate value.
3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of simple orthophoto production as of the end of July 2013 is as follows:

1) The executing rate of 1:25,000 scale simple orthophoto production
Approx. 20,125 km^2 ÷ 144,000 km^2 = 0.140 Approx. 14.0%

2) The executing rate of 1:5,000 scale simple orthophoto production
Approx. 12.5 km^2 ÷ 1,417 km^2 = 0.009 Approx. 0.9%

2.3.5 GIS basic data

The work of GIS section was started from January 2012 by GIS section of IDMS, and the production of GIS basic data as of the end of July 2013 is shown in Table 2.3.5 "Production of GIS basic data as of the end of July 2013".

Table 2.3.5 Production of GIS basic data as of the end of July 2013

1:25,000 GIS Basic Data Production			1:5,000 GIS Basic Data Production		
Block No.	Area (km^2)	Production	City Name	Area (km^2)	Production
Block-1	16,275	6,912 finished	Sylhet	178	6.2 finished
Block-2	11,340	Not yet	Rajshahi	185	Not yet
Block-3	11,953	Not yet	Chittagong	575	Not yet
Block-4	8,908	7,437 finished	Khulna	329	Not yet
Block-5	5,300	Not yet	Barisal	148	Not yet
Block-6	16,885	Not yet			
Block-7	10,658	2,450 finished			
Block-8	12,461	Not yet			
Block-9	12,410	Not yet			
Block-10	9,063	Not yet			
Block-11	7,675	Not yet			
Block-12	11,989	Not yet			
Block-13	9,083	Not yet			
Total	144,000	16,799 finished	Total	1,417	6.2 finished

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.
2) The value of "Area (km^2)" is an approximate value.
3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of GIS basic data production as of the end of July 2013 is as follows:

1) The executing rate of 1:25,000 scale GIS basic data production
Approx. 16,799 km^2 ÷ 114,000 km^2 = 0.117 Approx. 11.7%

2) The executing rate of 1:5,000 scale GIS basic data production
Approx. 6.2 km^2 ÷ 1,417 km^2 = 0.004 Approx. 0.4%

2.3.6 Field identification

The work of field identification of Block-4 was started from December 2012 by field survey parties.

The production of field identification as of the end of July 2013 is shown in Table 2.3.6 "Production of field identification as of the end of July 2013".

Table 2.3.6 Production of field identification as of the end of July 2013

Field Identification for 1:25,000 Maps			Field Identification for 1:5,000 Maps		
Block No.	Area (km^2)	Production	City Name	Area (km^2)	Production
Block-1	16,275	8,050 finished	Sylhet	178	12.5 finished
Block-2	11,340	Not yet	Rajshahi	185	Not yet
Block-3	11,953	Not yet	Chittagong	575	Not yet
Block-4	8,908	7,700 finished	Khulna	329	Not yet
Block-5	5,300	Not yet	Barisal	148	Not yet
Block-6	16,885	Not yet			
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Total	144,000	20,125 finished	Total	1,417	12.5 finished

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.
2) The value of "Area (km^2)" is an approximate value.
3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of field identification as of the end of July 2013 is as follow:

1) The executing rate of 1:25,000 scale field identification
Approx. 20,125 km^2 ÷ 114,000 km^2 = 0.140 Approx. 14.0%

2) The executing rate of 1:5,000 scale field identification
Approx. 12.5 km^2 ÷ 1,417 km^2 = 0.009 Approx. 0.9%

2.3.7 Digital cartography (Production of digital topographic data)

The work of digital cartography (production of digital topographic data) was started from the end of January 2012 by Cartography Unit of IDMS.

The production of digital compilation as of the end of July 2013 is shown in Table 2.3.7 "Production of digital cartography as of the end of July 2013 (Production of digital topographic data)".

Table 2.3.7 Production of digital cartography as of the end of July 2013

(Production of digital topographic data)

1:25,000 Scale Digital Cartography (1:25,000 Scale Digital Topographic Data Production)			1:5,000 Scale Digital Cartography (1:5,000 Scale Digital Topographic Data Production)		
Block No.	16,275	Production	City Name	Area (km^2)	Production
Block-1	11,340	1,540 finished	Sylhet	178	Not yet
Block-2	11,953	Not yet	Rajshahi	185	Not yet
Block-3	8,908	Not yet	Chittagong	575	Not yet
Block-4	5,300	5,670 finished	Khulna	329	Not yet
Block-5	16,885	Not yet	Barisal	148	Not yet
Block-6	10,658	Not yet			
Block-7	12,461	Not yet			
Block-8	12,410	Not yet			
Block-9	9,063	Not yet			
Block-10	7,675	Not yet			
Block-11	11,989	Not yet			
Block-12	9,083	Not yet			
Block-13	144,000	Not yet			
Total	16,275	7,210 finished	Total	1,417	0

Note: 1) The area of Bangladesh territory is approximately 144,000 km^2.

2) The value of "Area (km^2)" is an approximate value.

3) According to the order from the Government of Bangladesh, SOB decided to prepare the 1:25,000 scale digital topographic maps of Block-7 as a matter of high priority. Therefore, the production of 1:5,000 scale digital mapping and so on was suspended from around November 2012.

Accordingly, the executing rate of digital cartography (Production of digital topographic data) as of the end of July 2013 is as follow:

1) Executing rate of 1:25,000 scale digital cartography (Production of digital topographic data)

   Approx. 7,210 km^2 ÷ 114,000 km^2 = 0.050 Approx. 5.5%

2) Executing rate of 1:5,000 scale digital cartography (Production of digital topographic data)

   1:5,000 scale digital cartography work is not yet started.

Chapter 3 Amendment of PDM

Chapter 3 Amendment of PDM

The PDM of BDMAP was amended as follows:

3.1 Original PDM of BDMAP (Version 0.1, 24 November 2008)

The original PDM of BDMAP was prepared by the Japanese Implementation Study Team for Bangladesh Digital Mapping Assistance Project during the period from 10 November 2008 to 28 November 2008. The original PDM of BDMAP is shown in Appendix 3.1 "PDM of BDMAP (Version 0.1, 24 November 2008)".

However, this original PDM has several matters in question as mentioned below. Through the discussion between JICA and BDMAP, it was decided that the minimum amendment for the original PDM of BDMAP (Version 0.1, 24 November 2008) was applied.

1) The activities and input of short-term expert (Geoid model) are not included in the original PDM of BDMAP (Version 0.1, 24 November 2008).

2) The project purpose of BDMAP and the relation between BDMAP and IDMS is not clearly mentioned on the original PDM of BDMAP (Version 0.1, 24 November 2008).

3) The activities mentioned on PDM of BDMAP (Version 0.1, 24 November 2008) are only the technical transfer concerning the digital mapping technique and does not include the support necessary for the implementation of IDMS such as project planning, project management, quality control and so on.

3.2 First amendment of PDM of BDMAP (Version 2.0, 6 August 2009)

Considering the above-mentioned matters and based on the proposal which was made by BDMAP, minimum amendment of PDM of BDMAP (Version 0.1, 24 November 2008) was executed and PDM (Version 2.0, 6 August 2009) was prepared before starting the activities of the 1st year of BDMAP through the discussion between JICA and BDMAP.

This minimum amended PDM of BDMAP is shown in Appendix 3.2 "PDM of BDMAP (Version 2.0, 6 August 2009)".

This minimum amended PDM of BDMAP (Version 2.0, 6 August 2009) was submitted and explained to the Bangladesh side on the explanation meeting of Inception Report of BDMAP

at the beginning of the 1st year of BDMAP and agreed by both parties.

The activity plan of BDMAP had to be modified due to the change of the important assumptions of BDMAP, and also the activities which were not mentioned on PDM of BDMAP (Version 2.0, 6 August 2009) had to be executed for the implementation of IDMS.

Considering these situation, it was mentioned that PDM of BDMAP (Version 2.0, 6 August 2009) should be modified according to the change of the important assumptions of BDMAP at the time of mid-term evaluation.

Finally, PDM of BDMAP (Version 2.0, 6 August 2009) was amended at the time of terminal evaluation of BDMAP which was executed at the beginning of December 2011.

3.3 Second amendment of PDM of BDMAP (Version 3.0, 23 November 2011)

The terminal evaluation of BDMAP was executed from 22 November 2011 up to 10 December 2011 by JICA. The influence caused by the change of important assumptions of BDMAP, countermeasures taken by BDMAP and SOB, and the activities not mentioned on PDM of BDMAP (Version 2.0, 6 August 2009) which were executed by BDMAP and so on were evaluated in the terminal evaluation of BDMAP.

Based on the results of terminal evaluation, new PDM of BDMAP (Version 3.0, 23 November 2011) was prepared and explained in the terminal evaluation meeting which was held on 8 December 2011.

On this terminal evaluation meeting, PDM of BDMAP (Version 3.0, 23 November 2011) was approved by JCC. PDM of BDMAP (Version 3.0, 23 November 2011) is shown in Appendix 3.3 “PDM of BDMAP (Version 3.0, 23 November 2011)”.

The main items of amendment of PDM of BDMAP are as follows:

1) The items which could not be executed due to the change of the important assumptions of BDMAP and so on were eliminated from the activities of PDM of BDMAP (Version 2.0, 6 August 2009) of BDMAP.

2) The activities, not including in PDM of BDMAP (Version 2.0, 6 August 2009), which were already executed during the implementation of BDMAP were added to new PDM of BDMAP (Version 3.0, 23 November 2011) of BDMAP.

3.4 Third amendment of PDM of BDMAP (Version 4.0, 27 March 2012)

Based on the results of terminal evaluation of BDMAP, several meetings concerning the extension of BDMAP between JICA Bangladesh Office and Bangladesh side were held, and R/D concerning the extension of BDMAP was signed on 27 March 2012 between JICA and Bangladesh side.

At the same time, new PDM of BDMAP (Version 4.0, 27 March 2012) including the new activities of the 4th years of BDMAP was prepared based on PDM of BDMAP (Version 3.0, 23 November 2011).

The activities of BDMAP (4th year) were executed based on PDM of BDMAP (Version 4.0, 27 March 2012).

Chapter 4 JCC and Seminar

Chapter 4 JCC and Seminar

During the implementation of BDMAP (4th year), JCC and seminar were held as mentioned below:

4.1 JCC meeting for supplemental terminal evaluation of BDMAP (4th year)

JCC meeting for supplemental terminal evaluation of BDMAP (4th year) was held on 26 June 2013 as follows:

1) Date: 26 June 2013 15:00～17:00
2) Place: Conference room of SOB
3) Participant: JICA Bangladesh Office
Mr. Naoki Matsumura, Project formulation adviser
Ministry of Defense (MOD)
Mr. Shamimuzzaman, Senior assistance chief
Survey of Bangladesh (SOB)
Lt. Co. Md Khairul Quadir, Director of development survey
Mr. Md. Mustafijur Rahman, Project manager, IDMS project
Maj. Md Robiul Haque, Assistant director (Survey)
Mr. Nayon Chandra Sarker, Assistant director (Survey)
Long Term Expert
Mr. Yamato Tanaka, Long term expert
BDMAP
Mr. Toru Watanabe, Chief/Project management

The details of discussion on JCC meeting are described on “Supplemental Terminal Evaluation Report for Bangladesh Digital Mapping Assistance Project” which will be prepared by JICA Bangladesh Office.

4.2 20 years anniversary party for technical cooperation between JICA and SOB

Due to the reason of destruction of building which was occurred on April 2013, war criminal issue at independence war, coming general election and so on, the social circumstances in Bangladesh became unstable and the hartal was repeatedly executed from January 2013.

Accordingly, 33 days hartal in total were executed during the 5 months from January 2013 to May 2013 in Bangladesh.

For the implementation of seminar, it is necessary to book a convention hall or a ballroom of hotel approximately two (2) months before the date of seminar.

Therefore, for the implementation of seminar at the end of August 2013, it is necessary to decide the location and also to book a convention hall or ballroom of hotel by the end of June 2013.

However, considering the present social circumstances of Bangladesh, it is difficult to estimate that the number of hartal will be decreased after May 2013 and before general election in Bangladesh.

Therefore, it is considered that the seminar during the daytime in this year has a high risk of hartal.

Meanwhile, JICA executed the technical cooperation projects concerning survey and mapping from 1992 continuously, and 20 years has been already passed on 2013, end of the 4th year of BDMAP, after staring the first technical cooperation project between JICA and SOB.

As a matter of course, a crowd of people, both Japanese and Bangladesh people, were engaged in the technical cooperation projects between JICA and SOB over the past 20 years.

Considering the present social circumstances of Bangladesh, instead of seminar, BDMAP planned to held “20 Years Anniversary Party for Technical Cooperation between JCIA and SOB” at nighttime inviting the people who have been engaged in the passed and present technical cooperation projects between JICA and SOB to convey thankfulness for the cooperation and assistance and also to ask further cooperation and assistance.

The details of “20 Years Anniversary Party for Technical Cooperation between JICA and SOB” are as follows:

1) Name of party:	20 Years Anniversary Party for Technical Cooperation between JICA and SOB
2) Organizer:	SOB and JICA Bangladesh Office
3) Date:	26 August 2013, 19:30～21:30
4) Place:	Ball Room of The Westin Dhaka
5) Participants:	Embassy of Japan JICA Bangladesh Office Japanese Experts JETRO Bangladesh Office Ministry of Defense (MOD)

Economic Relation Division (ERD)
Other Bangladesh Government Organizations
International Organizations
Private Companies in Bangladesh
Former surveyor generals, directors and others of SOB
Former persons of Japan Desk of ERD
Former secretary and persons of MOD
Former long term expert to SOB

6) Program:
1) Welcome speech by the Surveyor General of SOB
2) Speech by Mr. Yamato Tanaka, Long Term Expert
3) Speech by Dr. Tadao Toda, Chief Representative of JICA Bangladesh Office
4) Presentation ceremony of memorial gift
5) Dinner

4.3 Preparation of video of "20 Years of Technical Cooperation between JICA and SOB"

As already mentioned, 20 years has been already passed after starting the technical cooperation between JICA and SOB.

The video showing the passed and present technical cooperation projects between JICA and SOB, and the results of technical cooperation was prepared by BDMAP and this video was screened on the 20 years anniversary party for technical cooperation between JICA and SOB.

The DVD of this video was delivered to the participants of the 20 years anniversary party for technical cooperation between JICA and SOB.

Chapter 5 Minutes of Meeting

Chapter 5 Minutes of Meeting

Minutes of meeting signed during the activities of BDMAP (4th year) between SOB and BDMAP are as follows:

5.1 Minutes of meeting on the work plan of BDMAP (4th year)

The Work Plan of BDMAP (4th year) was prepared in Japan and submitted and explained to SOB before starting the activities of BDMAP (4th year) in Bangladesh.

Based on the discussion between SOB and BDMAP, the minutes of meeting on Work Plan of BDMAP (4th year) was prepared and signed on 28 June 2012 between SOB and BDMAP.

The minutes of meeting on Work Plan of BDMAP (4trh year) is shown in Appendix 5.1 "Minutes of Meeting on Work Plan for Bangladesh Digital Mapping Assistance Project (4th Year)".

5.2 Minutes of meeting on the draft final report (4th year)

At the end of the activities of BDMAP (4th year), the draft final report was prepared by BDMAP and submitted to SOB around the beginning of August 2013. The meeting on the draft final report was held on 05th August 2013 between SOB and BDMAP.

The draft final report was corrected based on the comments from SOB and final report was prepared in Japan.

The minutes of meeting on the draft final report is shown in Appendix 5.2 "Minutes of Meeting on Draft Final Report for Bangladesh Digital Mapping Assistance Project (4th Year)".

Chapter 6 Actual Assignment Periods of Experts of BDMAP

Chapter 6 Actual Assignment Periods of Experts of BDMAP

The actual assignment periods of experts of BDMAP are as follows:

6.1 Actual assignment periods of experts of BDMAP (4th year)

The actual assignment period of experts of BDMAP (4th year) are as follows:

Assignment	Name of experts	Assignment Period	Days
Chief/Project Management	Mr. Toru Watanabe	16/06/2012～14/08/2012	60 days
		27/10/2012～15/12/2012	50 days
		11/01/2013～24/02/2013	45 days
		03/05/2013～03/07/2013	62 days
		27/07/2013～07/09/2013	43 days
Digital plotting	Mr. Tsuneo Terada	16/06/2012～08/08/2012	54 days
		29/10/2012～12/12/2012	45 days
		14/01/2013～09/03/2013	55 days
		28/04/2013～08/06/2013	42 days
		13/07/2013～31/08/2013	50 days
Map inspection	Mr. Takashi Shimono	16/06/2012～06/07/2012	21 days
		14/01/2013～17/02/2013	35 days
		20/07/2013～16/08/2013	28 days
GIS management	Mr. Shigeru Ono	02/10/2012～31/10/2012	30 days
Administrative support	Mr. Jun Musha	16/06/2012～15/07/2012	30 days
		09/08/2013～07/09/2013	30 days
Total		Including administrative support	680 days
		Excluding administrative support	620 days

6.2 Actual assignment periods of experts of whole BDMAP (1st year～4th year)

The actual assignment period of experts of whole BDMAP (1st year～4th year) are as follows:

Assignment	Name of Experts	Trips	Total days
Chief/Technical specification/ Project management	Mr. Toru Watanabe	14 times	912 days
Photogrammetry/ Aerial triangulation theory	Dr. Mitsuru Nasu	2 times	24 days
Aerial triangulation/ Orthophoto/DEM (1)	Mr. Takashi Harada	6 times	300 days
Aerial triangulation/ Orthophoto/DEM (2)	Mr. Koji Yamazaki	3 times	130 days
Digital plotting	Mr. Tsuneo Terada	11 times	760 days
Digital compilation	Mr. Yoshiteru Matsushita	9 times	467 days
GIS management	Mr. Shigeru Ono	4 times	125 days
Map inspection	Mr. Takashi Shimono	3 times	84 days
Administrative support (1)	Ms. Michi Hayashi	5 times	234 days
Administrative support (2)	Ms. Kazue Uchiyama	1 times	23 days
Administrative support (3)	Mr. Jun Musha	2 times	60 days
Total Including administrative support	8 persons	52 times	2,802 days
Excluding administrative support	11 persons	60 times	3,119 days

Chapter 7 Equipment Used for BDMAP

Chapter 7 Equipment Used for BDMAP

The equipment procured on the 4th year of BDMAP, and the equipment and software donated to SOB from BDMAP are as follows:

7.1 Equipment procured by BDMAP (4th year)

No equipment was procured by BDMAP during the 4th year's activities of BDMAP.

7.2 Equipment donated to SOB

Based on the request from SOB, the equipment and software procured during the activities of BDMAP (1st year～4th year) were donated to SOB from BDMAP at the end of the activities of BDMAP (4th year).

The names of equipment and software are shown in Table 7.2.1 "List of equipment and software donated to SOB from BDMAP".

Table 7.2.1 List of equipment and software donated to SOB from BDMAP

Name of Equipment & Software	Details of Equipment & Software	No.
A. Equipment and software procured in Bangladesh		
1) Computer	DELL Precision T3500, Xeon X5550 2.66 GHz	1
	DELL Precision T3500, Xeon W3520 2.66 GHz	4
2) Printer (B/W with Copier)	Canon image CLASS, MF6550	1
3) Printer (Color, A3 size)	Canon LASER SHOT LBP5970	1
4) Large Format Printer (Plotter)	Canon Image PROGRAF iPF710	1
5) UPS		5
6) Back Up Power Supply		1
7) OS	Micro-Office 2007 Professional	5
8) Adobe Acrobat	Adobe Acrobat Standard 9	5
9) Antivirus software	Symantec Norton 360	5
10) Graphic software	Photo Shop CS4 Extended	5
11) Graphic software	Illustrator CS4	5
12) Network		1
13) 3D stereo mirror monitor	Planar Systems, Inc.	3
14) Stealth 3D mouse	Stealth International, LLC	3
15) 3D glass		6
B. Equipment and software procured in Japan		
1) Computer	CF-52W1AAS	1
2) OS	WIN-XP-PRO-SP3/OEM/E	1
3) OS	Micro-Office 2007 PRO	1
4) Graphic software	Illustrator CS4	1
5) Hard-disc	250 GB, IO-DATA, 1.5 inch	10

Chapter 8 Implementation Procedure of BDMAP (4th Year)

Chapter 8 Implementation Procedure of BDMAP (4th Year)

Implementation procedure and lessons learned through the implementation of BDMAP from the 1st year to the 3rd year and recommendations are described in "Final Report of Bangladesh Digital Mapping Assistance Project (1st year to 3rd year)".

The period of BDMAP from the 1st year to the 3rd year is a period of technical training to the staff of SOB and the beginning stage of 1:25,000 and 1:5,000 scale digital photogrammetric mapping of IDMS.

BDMAP judged that fundamental techniques necessary for the implementation of digital photogrammetric mapping were already transferred to the staff of SOB during the period from the 1st year to the 3rd year of BDMAP.

However, it is impossible to execute digital photogrammetric mapping project smoothly and effectively even though the staff of SOB obtained the fundamental techniques of digital photogrammetric mapping.

From technical point of view, during the implementation of digital photogrammetric mapping project, unexpected issues which are not described in textbooks and manuals will be occurred.

Therefore, the capability to solve such unexpected issues (capability of troubleshooting) will be required for the implementation of digital photogrammetric mapping project.

Meanwhile, from the viewpoint of management, for the smooth and effective implementation of digital photogrammetric mapping project, knowledge, experience and capability of proper project planning, budget management, progress management, accuracy and quality management, and so on are essential.

Accordingly, following five (5) items were decided as the main activities of BDMAP (4th year) on the condition that basic techniques of digital photogrammetric mapping were already transferred to the staff of SOB during the period of BDMAP from the 1st year to the 3rd year.

1) Technical troubleshooting during the implementation of IDMS
2) Planning of implementation plan of IDMS
3) Progress management of IDMS
4) Accuracy and quality management of IDMS
5) Overall management of IDMS

8.1 Issues on the implementation of BDMAP and IDMS (4th year)

Details of the activities of BDMAP from the 1st year to the 3rd year, and issues on the

implementation of BDMAP and IDMS from the 1st year to the 3rd year are described in "Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year).

Issues on the implementation of BDMAP and IDMS of the 4th year are basically same as the issues of BDMAP and IDMS from the 1st year to the 3rd year.

Following are the articles which are described in Chapter 9 "Implementation Procedure of BDMAP", Clause 9.1 "Issues on the implementation of BDMAP and IDMS" of "Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year).

1) Lack of experience of digital photogrammetric mapping project
2) Lack of project planning capability
3) Lack of project management capability
4) Lack of troubleshooting capability
5) Lack of independence sense of the staff of SOB

8.2 Implementation procedure of BDMAP (4th year)

Implementation procedures of BDMAP form the 1st year to the 3rd year are described in Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year).

Implementation procedures of BDMAP (4th year) are basically same as the implementation procedures of BDMAP (1st year～3rd year).

Following are the articles which are described in Chapter 9 "Implementation Procedure of BDMAP", Clause 9.2 "Implementation procedure of BDMAP" of "Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year).

1) Improvement of the basic capability focusing on the basics of computer operation and photogrammetric mapping
2) Weight on the actual work and on-the-job training
3) Buildup of project management capability
4) Planning and implementation of IMDS by the staff of SOB by themselves
5) To solve issues and troubles as much as possible at the beginning of IDMS
6) Basic concept of "Plan ⇒ Do ⇒ Check ⇒ Action"
7) Communication among the sections of SOB

In addition of the above-mentioned items, activities of BDMAP (4th year) were executed considering of the following items.

8.2.1 Basic concept of "Plan ⇒ Do ⇒ Check ⇒ Analysis ⇒ Action"

During the implementation of digital photogrammetric mapping project, many issues and trouble will always be arisen, and persons in charge of the project will be burned out for solving the issues and troubles. This situation will be arisen in any countries and any organizations in the world.

In general, it is explained that the project will be implemented by the cycle of "Plan ⇒ Do ⇒ Check ⇒ Action" on the textbook of project management.

However, correctly, the cycle of "Plan ⇒ Do ⇒ Check ⇒ Action" is not enough for project management from the view points of smooth and effective implementation of the project.

For the smooth and effective implementation of the project, this cycle will be as "Plan ⇒ Do ⇒ Check ⇒ Analysis ⇒ Action". The meanings of each step are as follows:

Plan:	Preparation of project implementation plan
Do:	Execution of actual works according to the plan
Check:	Periodical check of accuracy and quality, work progress, budget and so on
Analysis:	Causal analysis of the issues and preparation of countermeasures to solve the issues and also not to occur the same issues again and again
Action:	Execution of countermeasures based on "Analysis".

Issues and troubles during the implementation of the project are unavoidable. The key point of project management is not to solve the issues and trouble which were already arisen, but to take suitable countermeasures not to occur the same issues and troubles again and again.

Especially, in case of huge project consisting of many peoples such as IDMS, only to solve the issues one by one, same issues will be arisen frequently. As a result of frequent same issues, deterioration of accuracy and quality of digital topographic data/maps and increase of project period and cost will be occurred.

In very simple term, high frequency of same issues mean that proper project management is not executed.

Through the activities of BDMAP from the 1st year to the 3rd year, it is estimated that the staff of SOB have already grasped an understanding for the concepts of "Plan, "Do" and "Check".

However, it is estimated that the concept of "Analysis" is still not yet well understood by the staff of SOB.

Therefore, the concept of "Analysis" was put a high priority on the activities of BDMAP (4th year).

8.2.2 Buildup of cause analysis capability

As already described above, following two (2) capabilities are necessary for the project cycle of "Plan ⇒ Do ⇒ Check ⇒ Analysis ⇒ Action" on project management.

1) Capability of causal analysis of issues
2) Capability of preparation of countermeasures not to occur the same issues

As a matter of course, "Capability of causal analysis of issues" means a capability to examine a cause(s) and correlation of issue(s). Without causal analysis of issues, it is impossible to make a countermeasure to solve the issues and also not to occur the same issues again and again.

As already mentioned, during the project implementation, it is surely unavoidable that issues and troubles will be arisen, and IDMS is no exception.

Therefore, a proper project management is essential for huge project consisting of many people such as IDMS.

The basic concept of project management is a cycle of "Plan ⇒ Do ⇒ Check ⇒ Analysis ⇒ Action", and "Analysis" is the most important element of this cycle of project management.

Many staff of SOB has an understanding that it is necessary to solve the issue and trouble when it was happed. However, the persons who try to analyze the reason(s) of issue and trouble are very few or zero.

It is not sure that this phenomenon is a particular phenomenon of SOB or not. Also, it is not sure that this phenomenon is caused by the defects of technical education in Bangladesh or not.

Anyway, buildup of technical capability and project planning and management capability can not be expected without a way of thinking to analyze the source of issues when issues were occurred.

Therefore, the concept of "To analyze the source of issues" was put a high priority on the activities of BDMAP (4th year).

8.2.3 Countermeasures to prevent the same issues

During the implementation of project, especially project consisting of many persons, phenomena of repeat of same issue will be occurred frequently.

In case without proper countermeasure(s) to the issue(s) during the implementation of the project, the possibility of repeat of the same issue(s) is very high.

As already describe in previous Clause, it is emphasized that causal analysis is necessary when issue was occurred, and it is necessary to take countermeasures not to occur the same issue again and again.

Main cause of "Repeat of same issue" is lack of "Action" to prevent the repeat of same issue.

However, another cause of "Repeat of the same issue" may be existed in IDMS.

On the lecture of project management, BDMAP pointed out that ideas of "Communication in project team" and "Necessary information must be delivered to all person concerned immediately" are the basic concept of project management.

In other words, in case that information of issues or errors, countermeasures to prevent the same issues and so on does not deliver to all persons concerned, same issue will be repeated by the person who does not yet receive the information.

For the smooth implementation of project, it is necessary to prevent the repeat of same issues and troubles as much as possible, even though issues and troubles during the operation of project are unavoidable.

Therefore, the concept of "To prevent the repeat of same issues and troubles" was put a high priority on the activities of BDMAP (4th year).

8.2.4 Numeric conversion and visualization on progress management

For the evaluation of the progress of project (e.g. behind on schedule or ahead of schedule), progress management of the project is essential. The staff of SOB has an understanding of this matter.

However, many staff of SOB has no knowledge and experience of progress management for digital photogrammetric mapping project.

There are several progress management methods for digital photogrammetric mapping project. By any method, it is possible to grasp the progress of the project.

Important points of progress management are "Numerical conversion" and "Visualization" of project progress to be able to easily understand the progress of project by everyone.

The staff of SOB who has a concept of "Numerical conversion" and "Visualization" is very limited. It is considered that this is one of the main issues concerning progress management of IDMS and SOB.

Therefore, the concepts of "Numerical conversion" and "Visualization" were put a high priority on the activities of BDMAP (4th year).

8.2.5 Establishment of proper data checking and correction system

It is necessary to establish the production system and methodology of production for the implementation of digital photogrammetric mapping project.

Also, at the same time, it is necessary to establish a system and methodology for checking and correction of digital plotting data, GIS basic data, digital topographic data and so on.

In general, there are two checking methods for engineering and industrial products.

1) Process check method

Intermediate products of each step will be checked and corrected. Only the products passed an inspection will be delivered to the next step of work.

In general, process check method is used for the products which will be produced by many work steps.

2) Product check method

Inspection will not be executed to intermediate products and will be executed only to the final products by random inspection.

In case that error ratio of the final products is over a certain level, all final products will be judged as "Disqualified product".

In general, product check method is used for the industrial products which will be produced in factory.

In general, process check method is applied for digital topographic mapping project.

Because, digital topographic mapping project consists of many step of works, and output of previous step of work become input of subsequent step of work in digital photogrammetric mapping work procedure.

It is difficult to avoid the under-mentioned risk in case product check method is applied for digital photogrammetric mapping.

In case the products are judged as "Disqualified products" by the product check for the digital topographic data/maps, it is necessary to execute whole works of digital topographic mapping once again from the beginning.

Therefore, it is considered that product check method for digital photogrammetric mapping project is very risky method in comparison with process check method, and it is difficult to keep sufficient accuracy and quality of digital topographic data/maps by product check method.

IDMS is the first and huge digital photogrammetric mapping project for SOB. Therefore, it is necessary to establish a proper checking and correction system and methodology to keep the accuracy and quality of digital topographic data/maps and other data which will be produced by IDMS.

However, the staff of SOB has no experience of digital photogrammetric mapping using aerial photos, and especially the staff of SOB has no knowledge and know-how of digital data checking at each step of digital photogrammetric mapping procedure.

Therefore, "Establishment of checking and correction system and methodology" was put a high priority on the activities of BDMAP (4th year).

8.3 Lessons learned through the implementation of BDMAP and IDMS (4th year)

Lesson learned through the implementation of BDMAP (1st year～3rd year) and IDMS are described in "Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year)".

Lesson learned through the implementation of BDMAP (4th year) and IDMS are basically same as the lesson learned of BDMAP (1st year～3rd year).

Following are the articles which are described in Chapter 9 "Implementation Procedure of BDMAP", Clause 9.3 "Lesson learned through the implementation of BDMAP and IDMS" of "Final Report of Bangladesh Digital Mapping Assistance Project (BDMAP) (1st year～3rd year)".

1) For the implementation of the project, not only the technical capability, but also the planning and management capability are essential.
2) Lecture and training are not enough for capacity building.
3) Theory can not be automatically applied to the actual work (project).
4) Engagement in the actual is the best teacher.
5) Human learns only from one's failure.

In addition of the above-mentioned items, new lesson learned through the implementation of BDMAP (4th year) and IDMS are as follows:

8.3.1 Poor project planning and management will obstruct a smooth implementation of IDMS

Poor project planning and management will obstruct a smooth and effective implementation of project, and become a cause of issues and troubles, and increase the volume of re-works at every step of digital photogrammetric mapping work.

Following are typical issues caused by poor management which were occurred during the implementation of IDMS.

1) Same number of digital plotting sheet was assigned to two (2) digital plotting operators at the same time. Therefore, two (2) digital plotting data of the same sheet were prepared.

   A careless mistake at the time of implementation planning of digital plotting is a cause of this issue.

2) At the time of checking and correction of digital plotting data, checking and correction inside of digital plotting sheet were executed at the beginning.

   However, the checking and correction of data between adjacent sheets must be executed at the beginning.

   Therefore, checking and correction of digital plotting data had to execute again and again due to the wrong order of checking and correction of digital data.

   Main reason of this issue is a wrong methodology of checking and correction of digital

plotting data instructed by the person in charge of digital plotting section even though BMDAP explained the proper checking and correction method and procedure of digital plotting data.

Even though the same issues were occurred again and again, the person in charge of digital plotting section did not take proper countermeasures not to occur the same issues again.

Thus, this issue became more serious and it took a long time to check and correct the digital plotting data.

3) Checking and correction of digital plotting data were not executed block by block. Therefore, checking and correction between adjacent sheets were not able to execute by the supervisors of digital plotting section. As a result, it took a long time for checking and correction of digital plotting data.

Main reason of this issue is a wrong methodology of checking and correction of digital plotting data instructed by the person in charge of digital plotting section even though BMDAP explained the proper checking and correction method and procedure of digital plotting data.

Even though the same issues were occurred again and again, the person in charge of digital plotting section did not take proper countermeasures not to occur the same issues again.

Thus, this issue became more serious and it took a long time to check and correct the digital plotting data.

4) Before the implementation of field identification, the person in charge of field identification did not execute necessary technical training and instruction to the field surveyors even though this is a first work for the staff of SOB.

Therefore, the quality of field identification data among the field surveyors became not a same level.

A poor project implementation planning is a cause of this issue. Also, it is judged that no clear operating instruction to the field surveyors by the person in charge of field identification made this issue more complicate.

5) After completion of digital cartography, QC section of SOB executed a final check of digital topographic data/maps. However, many times of checking and correction among

QC section and other sections were executed.

A poor project implementation planning is a cause of this issue. In case checking and correction are repeated again and again, it is necessary to consider that fundamental defect(s) exists in checking and correction method and procedure.

However, person in charge of QC section did not have this way of thinking. In general, checking and correction of digital topographic data/maps and so on have to be completed within three (3) times.

In case that more than three (3) times checking and correction is necessary, it is necessary to check and analyze the method and procedure of checking and correction.

5) Same issues and troubles occurred again and again. However, person in charge did not take a necessary countermeasure not to occur the same issues and troubles.

Lack of project management capability of the person in charge is a cause of this issue.

The person in charge has no sense and capability to analyze the cause of issues and troubles.

7) After finding the issues and trouble, the person in charge did not convey the necessary information to all staff concerned. Therefore, it took a long time for complete settlement of issues and troubles.

Lack of project management capability of the person in charge is a cause of this issue. The person in charge did not understand that many staff belongs to the person in charge and waiting his or her instruction.

The loss caused by the delay of information transmittance to the staff (man/day) means "Number of staff to be informed × delayed days".

Above-mentioned cases are part of issues and troubles occurred during the implementation of IDMS.

In case the person in charge prepare a proper project implementation plan and execute a proper project management, it is considered that many of these issues or trouble can be avoided or proper countermeasures can be taken much earlier.

That is to say, to be able to execute IDMS smoothly and effectively fully depend on the

capability of "Section in Charge" or "Team Leader" of IDMS project team.

8.3.2 Checking and correction system for digital data

SOB executed secular change of the existing 1:50,000 scale topographic maps by ground survey method. So, organization of 1:50,000 scale topographic maps checking (QC section) is already existed in SOB.

However, the staff of QC section in SOB has a knowledge and experience for analogue topographic map checking, but has not a knowledge and experience of digital topographic data/maps checking.

Therefore, it is considered that present QC section is a section for inspection of analogue topographic maps (printed topographic maps), and not a section for digital data and digital topographic data.

Final products of IDMS are both digital data such as digital topographic data and printed topographic maps. Therefore, QC section of SOB has to have a capability to be able to check not only the quality of printed topographic maps, but also quality of digital topographic data.

For this purpose, it is necessary to review the present checking system and procedure of QC section, and also it is necessary to recruit or educate the person who can check the digital data such as digital topographic data and so on.

To check the digital data such as digital topographic data and so on, not only the knowledge and experience of computer and software related to photogrammetric mapping, but also the knowledge and experience of overall digital photogrammetric mapping, geomorphology, cartography and so on.

Unfortunately, at present, there is no person who has enough knowledge and experience of digital data inspection in SOB.

Therefore, it is necessary to train and educate the person who can check digital data such as digital topographic data according to the plan.

8.3.3 Who are the key persons of the implementation of IDMS?

Any organization consists of four (4) hierarchies (e.g. Top management, Middle management, Lowly employee and Staff) as shown in Figure 8.3.1 "Organization structure".

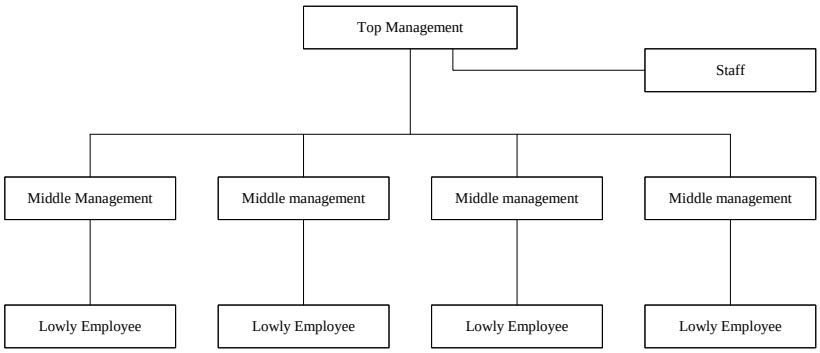


Figure 8.3.1 Organization structure

The line of "Top management ⇒ Middle management ⇒ Lowly employee" is a line organization and "Staff" is a staff organization.

It is sure that the top management has a power to make a final decision and has to take a responsibility for the decision.

However, who have to execute management of daily operations of organization and daily operational management of the project?

Maybe, this question is an underlying cause of IDMS and SOB.

Many staff of SOB, including the middle class staff, has an intense consciousness of a feeling that all matters will be decided by the top management, and the top management will give an order to the middle management.

That is to say, the attitude and way of thinking of many middle class staff of SOB are inactive and they are always waiting the instructions from the top management.

From the view point of above-mentioned mentality of the middle class staff of SOB, is it surely possible to implement IDMS by the staff of SOB smoothly and effectively?

In other word, every thing of organization and project, including from huge issue to minor problem, can be decided and instructed by the top management or not. Maybe, this is practically impossible.

For smooth activities of organization, organization structure, posts in organization, power and responsibility of posts are defined.

The middle management has a responsibility to submit a report concerning daily activities, progress of project, issues encountered and so on to the top management periodically.

At the same time, the middle management has a responsibility to make an operation plan, problem-solving method in case of issue and so on, and has a responsibility to obtain the approval from the top management.

Based on the approval from the top management, the middle management has a responsibility to implement daily activities and management of project.

Based on the periodical report from the middle management, the top management will grasp the situation of daily activities of organization, progress of project, issues arisen and so on, and the top management will issue instructions to the middle management according to need.

As a matter of course, items and issues relating whole organization, issues having a great impact to project and so on are items to be directly handled by the top management.

That is to say, the main body of planning, operation and management of daily operation of organization and project are the middle class staff of organization (the middle management).

In case of IDMS, the middle management of IDMS corresponds to “Section in Chief” and “Team Leader”. Therefore, these staff has a responsibility for planning and management of daily works of IDMS.

As a matter of course, items and issues having relations with multiple sections and issues having a critical impact on the project and so on have to be judged and decided directly by the top management.

However, in this regard, to sort out a problem, to find a solution of issue and also to explain them to the top management is a task of the middle management.

The organizational issue of SOB is that the middle class staff of SOB, excepting few middle class staff of SOB, is not sufficiently aware of above-mentioned matters.

During the activities of BDMAP from the 1st year to the 4th year, BDMAP explained repeatedly that SOB will not be able to execute digital photogrammetric mapping project, especially huge project such as IDMS, even though the technical aspects of digital photogrammetric mapping were transferred to the staff of SOB.

Ultimately, this means the level or quality of consciousness of the middle class staff (the

middle management) of SOB.

Chapter 9 Project Achievement Ratio

Chapter 9 Project Achievement Ratio

The project purpose of BDMAP and its achievement ratio are as follows:

9.1 Project purpose and indicators

The main purpose of BDMAP is to execute the technical training of digital photogrammetric mapping to the staff of SOB.

The main purpose of IDMS is to produce 1:25,000 scale digital topographic data/maps covering whole territory of Bangladesh and 1:5,000 scale digital topographic data/maps covering major five (5) cities based on the results of the technical transfer which will be executed by BDMAP.

However, it is considered that original PDM (Version 0.1, 24 November 2008) of BDMAP has not been prepared in consideration of the relation between BDMAP and IDMS.

The indicators for the activities of BDMAP shown in original PDM (Version 0.1, 24 November 2008) are as follows:

1) Plan of training is made.
2) Operation manual is made.
3) Training is conducted and at least 70 % of the participants of the training understand about the operation manual.
4) OJT is conducted to at least 70 % of SOB technical staffs in the respective field.

It is considered that the activities and indicators of original PDM (Version 0.1, 24 November 2008) have the under-mentioned issues.

9.1.1 Is it possible to implement IDMS only by the transfer of digital photogrammetric mapping technique to the staff of SOB?

The overall goal of BDMAP is that SOB will implement the project of "Improvement of Digital Mapping System of Survey of Bangladesh (SOB)".

Therefore, SOB has to make an appropriate project planning for the production of 1:25,000 and 1:5,000 scale digital photogrammetric mapping, and also to execute proper project management such as progress management, quality and accuracy control and so on.

For the implementation of huge digital photogrammetric mapping project such as IDMS, not only technical capabilities development, but also project planning and management capability development are essential.

However, the activities shown in original PDM (Version 0.1, 24 November 2008) of BDMAP are only the technical transfer of digital photogrammetric mapping, and the technical transfer of project planning and management, necessary for the implementation of huge digital mapping project, is not included in original PDM (Version 0.1, 24 November 2008).

9.1.2 Is it possible to implement IDMS smoothly if at least 70% of participants to the training understand the operation manual?

SOB procured 40 sets of digital mapping system for IDMS. As a matter of course, at least 40 digital plotting operators are necessary for 40 sets of digital mapping system.

SOB selected 40 persons for the digital plotting operators, and BDMAP executed technical training of digital plotting to these 40 persons of SOB.

Due to the reason of individual difference relating to technical comprehension, some person will be able to execute digital plotting relatively in a short period of time, others will not be able to execute digital plotting in an appropriate manner for a long period.

The exact meaning of the sentence of "Training is conducted and at least 70 % of the participants of the training understand about the operation manual" is not so clear.

However, it is considered that this sentence should be interpreted as "70 % of the staff of digital plotting section can execute digital plotting in an appropriate manner".

If so, in case that 28 persons (70 % of 40 persons) or more than 28 persons out of 40 persons in digital plotting section become able to execute digital plotting in an appropriate manner, it is possible to judge that the activities of BDMAP has an enough anticipated efficacy.

However, IDMS is the project to produce 1:25,000 and 1:5,000 scale digital topographic data/maps by digital photogrammetric mapping method, and it is necessary to implement IDMS according to the project plan and schedule.

From the perspective of digital topographic data/maps production according to the project plan and schedule, the indicator of "Training is conducted and at least 70 % of the participants of the training understand about the operation manual" is judged as a meaningless indicator.

Simply stated, 28 sets (70 % of 40 sets) of digital plotting system out of 40 sets of digital plotting system are in operation, and remaining 12 sets (30 % of 40 sets) of digital plotting system are always idle. Therefore, the productivity of digital plotting will be 70 % or less than 70 %.

In general, more than 40 digital plotting operators for 40 sets of digital plotting systems are necessary for the smooth implementation of digital plotting.

Due to the personal reasons or organizational reasons such as participation to the other project, some member of the project will leave the project temporarily or permanently.

In this case, to keep the productivity of digital plotting as much as possible, it is necessary to assign the new operator immediately so that the digital plotting system will not be idle.

9.1.3 Is it possible to implement IDMS smoothly if OJT is conducted to at least 70% of technical staff of SOB?

The indicator of "OJT is conducted to at least 70 % of SOB technical staffs in the respective field" is also a meaningless indicator from the view points of production of digital topographic data/maps according to the project plan and schedule of IDMS.

For the smooth and efficient implementation of IDMS, all operators have to be able to engage in the work in an appropriate manner. If not, the productivity of IDMS is 70 % or less than 70 %.

Under such circumstances, before starting the actual works, it is judged that SOB will not be able to produce digital topographic data/maps according to the project plan and schedule of IDMS.

Therefore, it is considered that these two indicators are not suitable as indicators to evaluate the achievement ratio of BDMAP.

9.1.4 What are the suitable indicators for project purpose?

As mentioned above, it is considered that the indicators which are defined on original PDM (Version 0.1, 24 November 2008) of BDMAP are not suitable indicators for the evaluation of achievement ratio of BDMAP and also IDMS.

Therefore, it is necessary to define the suitable indicators for the evaluation of achievement ratio of BDMAP and IDMS instead of the indicators which are described in original PDM

(Version 0.1, 24 November 2008) of BDMAP.

In case than the main purpose of activities of BDMAP is defined as support for the activities of IDMS (Production of 1:25,000 and 1:5,000 scale digital topographic data/maps) from the technical, planning and management points of view, the outputs of the activities of BDMAP will be expressed as the outputs (i.e. progress and quality) of IDMS.

Therefore, it is considered that the progress of 1:25,000 and 1:5,000 scale digital topographic data/maps production, and the accuracy and quality of these digital topographic data/maps produced by IDMS are suitable indicators for the evaluation of activities of BDMAP and also IDMS.

The outline of new indicators which were discussed between Terminal Evaluation Team sent by JICA Head Office and BDMAP at the end of the 3rd year of BDMAP are as follows:

1) Progress of 1:25,000 scale digital topographic mapping
   1:25,000 scale digital mapping at Block-4 will be completed.

2) Progress of 1:5,000 scale digital topographic mapping
   1:5,000 scale digital topographic maps at Sylhet City will be completed.

3) Productivity of digital topographic mapping of IDMS
   Productivity of digital topographic mapping of IDMS will be improved.

4) Accuracy and quality of digital topographic data/maps of IDMS
   Accuracy and quality of digital topographic data/maps produced by IDMS will be improved.

9.2 Progress of 1:25,000 scale digital topographic data/maps production

The progress of 1:25,000 scale digital topographic data/maps production is described in Chapter 2 “Outline of the Activities and Outputs of BDMAP (4th Year), Clause 2.3 “Outline of the outputs of IDMS (4th year)”.

Appendix 9.1 “Progress of 1:25,000 scale digital plotting as of the end of July 2013” and Appendix 9.2 “Progress of 1:25,000 scale digital cartography as of the end of July 2013” show the production of 1:25,000 scale digital plotting (Inlet of digital photogrammetric mapping) and digital cartography (Outlet of digital photogrammetric mapping) of IDMS at the check points.

The summary of 1:25,000 digital plotting and cartography of each Block as of the end of July 2013 is shown in Table 9.2.1 “Progress of 1:25,000 scale digital plotting and cartography as of the end of July 2013”.

Table 9.2.1 Progress of 1:25,000 scale digital plotting and cartography as of the end of July2013

Block No.	Sheet Number	Digital Plotting			Digital Cartography		
		In operation	Completion	Rate of completion	In operation	Completion	Rate of completion
Block-1	122	6	116	95.0%	12		
Block-2	71	7	3	4.2%			
Block-3	72	15	3	4.2%			
Block-4	62	2	60	96.7%	10	25	41.6%
Block-7	66		25	37.8%			

1:25,000 scale of digital plotting of more than 95 % sheets of Block-1 and Block-2 were already completed by the end of July 2013.

In addition to digital plotting of Block-1 and Block-2, 1:25,000 scale digital plotting of Block-7 (25 sheets, approximately 38% of Block-7), which were requested by the Government of Bangladesh to be produced on a priority basis, were also completed by the end of July 2013. At present, 1:25,000 scale digital plotting of Block-2 and Block-3 is in operation by IDMS.

Concerning 1:25,000 scale digital cartography, 25 sheets of Block-4 (approximately 41% of Block-4) were already completed and 10 sheets of Block-4 (approximately 16% of Block-4) were under final checking by QC section as of the end of July 2013.

Based on the above-mentioned situation and indicators which were discussed between Terminal Evaluation Team sent by JICA Head Office and BDMAP at the end of the 3rd year of BDMAP, it is judged that project purpose concerning 1:25,000 scale digital topographic data/maps production has been nearly achieved as of the end of July 2013.

Concerning 1:5,000 scale digital topographic data/maps production, due to the order from the Government of Bangladesh, 1:5,000 digital topographic data/maps production was interrupted from November 2012.

Therefore, it is impossible to judge the achievement of project purpose of 1:5,000 scale digital topographic data/maps by the progress of 1:5,000 scale digital topographic maps production as of the end of July 2013.

Concerning productivity of IDMS, and accuracy and quality of digital topographic data/maps of IDMS, detailed analysis are described in Clause 9.4 “Productivity of IDMS” and Clause 9.5

"Accuracy and quality of digital topographic data/maps".

However, continuous monitoring for 1:25,000 and 1:5,000 scale digital topographic data/maps production and also productivity of IDMS are indispensable during the implementation of IDMS.

9.3 Progress of 1:5,000 scale digital topographic data/maps production

The progress of 1:5,000 scale digital topographic data/maps production is described in Chapter 2 "Outline of the Activities and Outputs of BDMAP (4th Year)", Clause 2.3 "Outline of the outputs of IDMS (4th year)".

By order of the Government of Bangladesh, SOB decided to produce 1:25,000 scale digital topographic data/maps at Block-7 as a top priority work.

Therefore, 1:5,000 scale digital topographic data/maps production was interrupted from November 2012, and available equipment and manpower of digital plotting section were put in 1:25,000 scale digital plotting of Block-7 from November 2012.

By order of the Government of Bangladesh and decision by SOB, production of 1:5,000 scale digital topographic data/maps at Sylhet City was behind on the original schedule.

Therefore, it is difficult to evaluate the achievement of project purpose of BDMAP and IDMS by 1:5,000 scale digital topographic data/maps production.

However, such order of the Government of Bangladesh means that the Government of Bangladesh acknowledges the value of IDMS (importance of digital topographic data/maps for national development).

Therefore, in case same kind of order comes from the Government of Bangladesh to SOB, it is recommended to comply with such order of the Government of Bangladesh as much as technically and practically possible.

9.4 Productivity of IDMS

It is possible to evaluate the productivity of digital plotting, digital cartography and so on of IDMS by tracing the change of values of "Schedule Performance Index (SPI)" which will be calculated based on the values of "Planned Value (PV)" and "Earned Value (EV: actual

quantity of work)" at check points of EVM which were prepared before the start of IDMS.

IDMS is the first and huge digital photogrammetric mapping project for SOB. Therefore, the values of SPI during the initial stage of digital topographic data/maps production of IMDS are estimated to become below "1.0" due to the various reasons such as poor planning and management, low technical skill of operators and so on.

Therefore, it is necessary to evaluate the change of values of SPI as time passes. For example, the values of SPI become high or low or no change as time passes.

The production of digital photogrammetric data/maps on each month will be changed according to the special circumstances of each month. Therefore, at the time of evaluation of the values of SPI, it is necessary to consider the special circumstances of each month in Bangladesh.

In Bangladesh, the working hours per day in fasting period is one hour shorter than usual period. Furthermore, actually, approximately one week Ramadan holiday exists after fasting period.

Therefore, actual working hours in fasting and Ramadan holiday period (month), and Eid holiday period (month) is fairly shorter than the usual period (month).

9.4.1 Change of SPI values of 1:25,000 scale digital plotting

Figure 9.4.1 "Change of SPI values of 1:25,000 scale digital plotting" shows the change of SPI values of digital plotting, inlet of digital photogrammetric mapping work, at check points of EVM.

At the beginning of 1:25,000 scale digital plotting, SPI values of digital plotting became "0.9" at October 2011 (highest SPI value of 1:25,000 scale digital plotting), and the SPI values of digital plotting came down drastically after October 2011.

This descent of SPI values was caused by the huge volume of errors found by the check of digital plotting data which were produced during the period from June 2011 to October 2011.

Due to many errors and mistakes of digital plotting data, it took huge time for check and correction of these digital plotting data. For this reason, the SPI values of 1:25,000 scale digital plotting came down to "0.62" as of September 2012 (lowest SPI value of 1:25,000 scale digital plotting).

This situation can be anticipated by the vastly-experienced engineers, and also it is possible to consider that SPI values of 1:25,000 scale digital plotting will be improved by the establishment of methodology of digital photogrammetric mapping in SOB such as errors and mistakes reduction method on digital plotting and other steps of digital topographic mapping, effective check and correction method to reduce the time for data check and correction, improvement of planning and management system and so on.

It is judged that the decrease of SPI values during the period from August 2012 to October 2012 was caused by the seasonal conditions such as fasting period, long holiday of Ramadan and Eid.

After October 2012, SPI values of 1:25,000 scale digital plotting shows a tendency to increase and SPI value of 1:25,000 scale digital plotting as of the end of July 2013 became “0.91”.

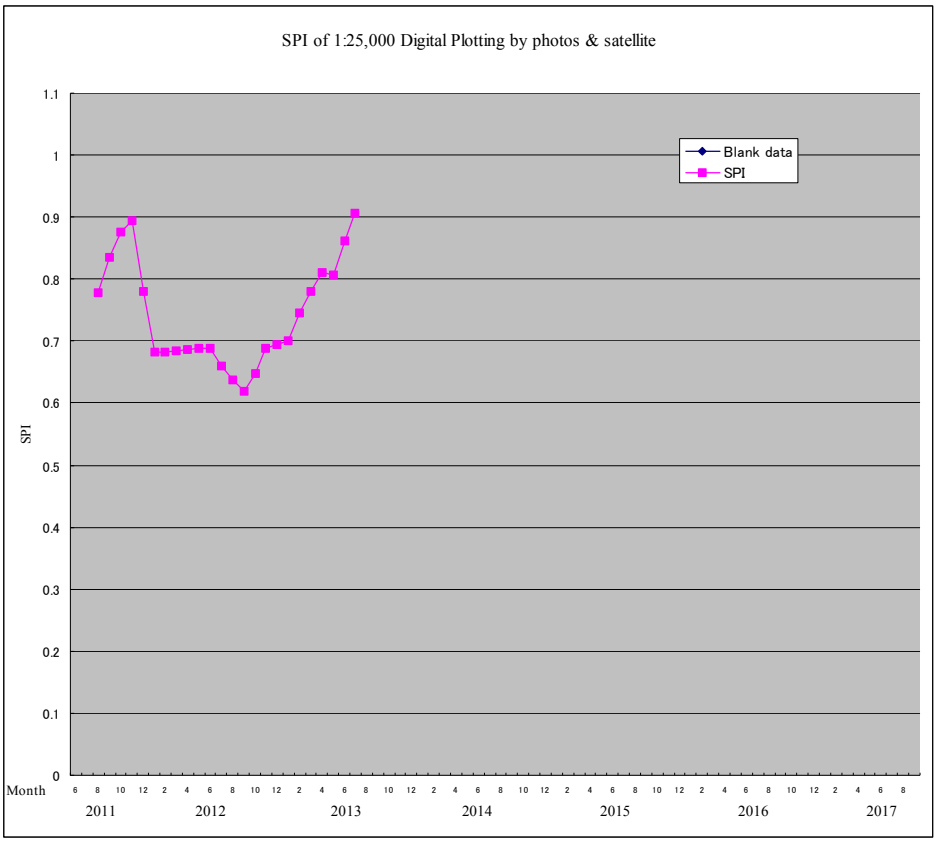


Figure 9.4.1 Change of SPI values of 1:25,000 scale digital plotting

9.4.2 When 1:25,000 scale digital plotting will be finished?

It is possible to estimate the time of completion of 1:25,000 scale digital plotting based on SPI values of 1:25,000 scale digital plotting. The prior conditions for estimation for time of completion of 1:25,000 scale digital plotting are as follows:

1) Starting date of work: June 2011
2) Number of digital plotting system: 36 sets
3) Digital plotting area: 144,000 km^2
4) Productivity of digital plotting:
   - Start of digital plotting: 1.50 km^2/equipment/day
   - From 8 months after start: 1.80 km^2/equipment/day
   - From 14 months after start: 2.00 km^2/equipment/day
   - From 26 months after start: 2.20 km^2/equipment/day
   - From 38 months after start: 2.40 km^2/equipment/day
   - From 50 months after start: 2.50 km^2/equipment/day
5) Schedule at completion (SAC): 90 months

Based on the above prior conditions and SPI value as of the end of July 2013 (SPI=0.91), the time of completion of 1:25,000 scale digital plotting can be calculated as follows:

1) SAC of 1:25,000 scale digital plotting: 90 months
2) SPI as of the end of July 2013: 0.91
3) Estimated working period: 98.9 months
4) Calculating Formula:
   SAC value ÷ SPI value = Estimated working period
   90 months ÷ 0.91 = 98.9 months

The starting date of 1:25,000 scale digital plotting on EVM is June 2011. Therefore, 98.9 months after starting date of 1:25,000 scale digital plotting means August 2019.

As a matter of course, the date of August 2019 exceeds the current project period of IDMS. Therefore, to shorten the working period of 1:25,000 scale digital plotting, it is necessary improve SPI value of 1:25,000 scale digital plotting higher than SPI value as of the end of July 2013.

The relation between SPI values and estimated working period of 1:25,000 scale digital plotting is shown in Table 9.4.1 “Relation between SPI values and estimated working period of 1:25,000 scale digital plotting”.

Table 9.4.1 Relation between SPI values and estimated time of completion of 1:25,000 scale digital plotting

Final SPI value	1.05	1.10	1.15	1.20	1.25
Estimated working period	85.7 months	81.8 months	78.2 months	75.0 months	72.0 months
Estimated time of completion	August 2018	April 2018	December 2017	September 2017	June 2017

Note: SAC = 90 months

Starting date of work: June 2011

According to table 9.4.1 "Relation between SPI values and estimated time of completion of 1:25,000 scale digital plotting", to be able to complete 1:25,000 scale digital plotting in the first half year of 2017, it is necessary to improve SPI values of 1:25,000 scale digital plotting (productivity of 1:25,000 scale digital plotting) up to "1.37" (approximately 37 % higher than SPI value as of the end of July 2013).

Calculating Formula:
Final SPI value ÷ SPI value at present = SPI ratio (productivity) to be improved
1.25 ÷ 0.91 = 1.37

The methods to improve the productivity of digital photogrammetric mapping are described in Chapter 10 "Issues to be tackled by SOB".

9.4.3 Change of SPI values of 1:25,000 scale digital cartography

Figures 9.4.2 "Change of SPI values of 1:25,000 scale digital cartography" shows the change of SPI values of 1:25,000 scale digital plotting that is an outlet of digital photogrammetric mapping works.

The digital cartography is the last work of a series of digital photogrammetric mapping works such as digital plotting, field identification, GIS basic data production and so on.

Therefore, SPI values of digital cartography will be greatly affected by the progress of previous works such as digital plotting, field identification and GSI basic data production.

Furthermore, the field identification, which will be executed before GIS basic data production and digital cartography, is difficult to execute in the rainy season in Bangladesh.

Therefore, the progress of field identification in the rainy season in Bangladesh will be almost zero (0).

For this reason, the progress of GIS basic data production and digital cartography, which are the subsequent works of field identification, will show the seasonal changes of production.

The SPI value of 1:25,000 scale digital cartography became "1.06" at November 2012 (highest SPI value of 1:25,000 scale digital cartography), and after this month, the SPI values of 1:25,000 scale digital cartography became down and the SPI value as of the end of July 2013 was "0.65".

It is considered that the decreasing of SPI value was caused by the following two reasons.

1) It took a long time to check and correct the errors and mistakes of 1:25,000 scale digital cartography works due to the huge numbers of errors and mistakes at the beginning of digital cartography works. The same situation was occurred in digital plotting section at the beginning of 1:25,000 scale digital plotting.

2) The necessary data for digital cartography was not delivered to cartography section from the previous section at the right time.

However, it is considered that the SPI values of 1:25,000 scale digital cartography will be improved, same as the SPI values of 1:25,000 scale digital plotting, according to the improvement of methodology, checking and correction system and so on through the implementation of actual works of 1:25,000 scale digital cartography works.

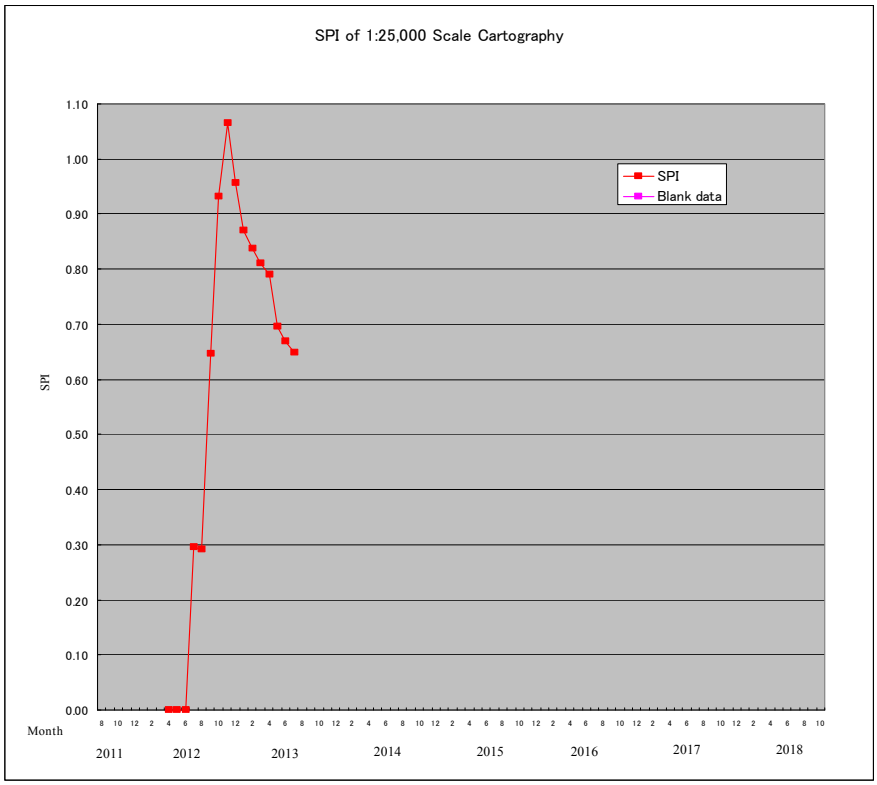


Figure 9.4.2 Change of SPI values of 1:25,000 scale digital cartography

9.4.4 When 1:25,000 scale digital cartography will be finished?

It is possible to estimate the time of completion of 1:25,000 scale digital cartography based on SPI values of 1:25,000 scale digital cartography. The prior conditions for the estimation for time of completion of 1:25,000 scale digital cartography are as follows:

1) Starting date of work: June 2011
2) Number of digital cartography system: 18 sets
3) Digital cartography area: 144,000 km^2
4) Productivity of digital cartography: 0.66 sheet/equipment/month
5) Schedule at completion (SAC): 91 months

Based on the above prior conditions and SPI value as of the beginning of August 2013 (SPI = 0.65), the time of completion of 1:25,000 scale digital cartography can be calculated as follows:

1) SAC of 1:25,000 scale digital compilation: 91 months
2) SPI value as of the end of July 2013: 0.65
3) Estimated working period: 140.0 months
4) Calculating Formula:

SAC value ÷ SPI value = Estimated working period

91 months ÷ 0.65 = 140.0 months

The starting date of 1:25,000 scale digital cartography on EVM is June 2011. Therefore, 140.0 months after starting date of 1:25,000 scale digital cartography means January 2023.

However, it is considered that this calculation (estimation) has no meaning at present considering the primary instability of the work and also the relatively short period of actual digital cartography works up to the end of July 2013. Maybe, this calculation (estimation) will become effective from around one (1) year later.

This calculation (estimation) comes into effect on the condition that the necessary data for digital cartography will be smoothly supplied from GIS section to digital cartography section.

Therefore, the estimation for time of completion of 1:25,000 scale digital cartography is more difficult than the estimation for time of completion of 1:25,000 scale digital plotting.

To shorten the schedule of digital cartography, not only to improve the productivity of digital compilation, but also to shorten the schedule of digital plotting, field identification and GIS basic data production which are the previous steps of digital cartography.

Especially, shortening of working period of digital plotting and field identification are the most important key factors for this task.

9.4.5 Ratio of labor quantity of digital photogrammetric mapping works

In general, the labor quantity of digital photogrammetric mapping works (excluding aerial photography and GCP survey) is estimated as shown in Table 9.4.2 "Approximate ratio of labor quantity of digital photogrammetric mapping works".

This ratio may be changed according to the scale of digital topographic maps to be produced, specifications of digital topographic mapping, equipment to be used, technical capabilities of personnel and organization and so on.

However, it is considered that this ratio may not be changed to a large degree.

Table 9.4.2 Approximate ratio of labor quantity of digital photogrammetric mapping

Item of work	Approximate percentage of labor quantity (man month)
Aerial triangulation	Approx. 5 %
Digital plotting	Approx. 45 %
Field identification	Approx. 20 %
GIS basic data production	Approx. 20 %
Digital compilation	Approx. 10 %
Total	100 %

In this table 9.4.2, the remarkable point is that approximately 1/2 of total labor quantity of digital photogrammetric mapping belongs to digital plotting.

This means that the work period of digital photogrammetric mapping will be decided mainly by the progress of digital plotting.

Therefore, at the time of preparation of work schedule of digital photogrammetric mapping, it is necessary to consider the work schedule of digital plotting at the beginning. The information necessary for the estimation of digital plotting work schedule are as follows:

1) Total digital plotting area
2) Number of available digital plotting systems
3) Number of available digital plotting operators
4) Working days per one month
5) Working hours per one day
6) Volume of digital plotting per one day (Productivity: km^2/day)

Work schedule of digital plotting will be considered based on the above-mentioned 6 factors. It is necessary to decide the values of above 6 factors before the estimation for work schedule of digital plotting.

However, it is difficult to decide the proper value of "6) Volume of digital plotting per one day (Productivity: km^2/day)" due to the various reasons such as capability of digital plotting operators, topographic conditions, land use, density of building and house and so on in the digital photogrammetric mapping area.

In case the value of productivity of digital plotting is decided much higher than the realistic value of productivity of digital plotting, the digital plotting work can not be executed according to the work schedule.

Meanwhile, in case the value of productivity of digital plotting is decided much lower than the realistic value of productivity of digital plotting, the total work period of digital photogrammetric mapping project will become very long, and the project will not be realized due to the long project period of digital photogrammetric mapping.

Roughly speaking, the necessary working period of digital photogrammetric mapping (not including aerial photography and GCP survey) will be estimated as "work schedule of digital plotting + work schedule of other works (approximately 3～12 months)".

"Work schedule of other works" will be changed mainly according to the volume of digital photogrammetric mapping area and number of equipment to be used. Furthermore, under-mentioned two (2) factors should be considered for the estimation of working period of digital photogrammetric mapping.

1) Volume of aerial triangulation and aerial triangulation blocks
2) Field works can be executed through the year or not.

In case the field identification is not able to execute in rainy season, it is difficult to execute the field identification immediately and continuously after completion of digital plotting. Therefore, total work schedule of photogrammetric mapping will become long.

In IDMS, the situations of above-mentioned two (2) factors of 1:25,000 scale digital photogrammetric mapping are as follows:

1) The total volume of aerial triangulation for 1:25,000 scale digital photogrammetric mapping is approximately 11,500 models. And this is considered as fairly large amount of aerial triangulation.

   For the implementation of aerial triangulation, the territory of Bangladesh was divided into thirteen (13) blocks. The necessary working period of aerial triangulation of each block is estimated as 2～3 months.

Therefore, digital plotting work can be started after completion of the first block of aerial triangulation.

2) In Bangladesh, it is difficult to execute the field identification in rainy season. Therefore, from around May to October, field identification is difficult to execute in Bangladesh.

   Accordingly, the field identification for the digital plotting data which are obtained during the rainy season (accurately, from the end of dry season to the beginning of next dry season) have to be executed in the next dry season.

Considering the above-mentioned matters, roughly speaking, the work period of 1:25,000 scale digital photogrammetric mapping of IDMS is estimated as "work schedule of digital plotting + approximately 12 months".

9.5 Accuracy and quality of digital topographic data/maps

Before the evaluation of accuracy and quality of digital topographic data/maps of IDMS, it is necessary to make clear the definition of accuracy and quality of digital topographic data/maps.

In general, accuracy and quality of digital topographic data/maps will be evaluated by the following six (6) factors.

1) Horizontal accuracy (horizontal discrepancy between digital topographic data/maps and real location)

In general, allowable horizontal error on topographic maps (printing map) is defined as 0.4 mm on the map. In case of digital data, the allowable horizontal error is approximately 1/2 of this value (approximately 0.2 mm on the map).

The horizontal accuracy in digital photogrammetric mapping will be decided by photo scale (or ground resolution), accuracy of ground control point survey, horizontal residual error of aerial triangulation, accuracy of data acquisition of digital plotting (skill of digital plotting operator) and so on.

2) Vertical accuracy (vertical discrepancy between digital data/maps (contour lines and spot heights) and real heights)

In general, allowable vertical accuracy is defined as 1/2 or 1/3 of the interval of intermediate contour lines.

The vertical accuracy of digital photogrammetric mapping will be decided by flight height of airplane, accuracy of ground control point survey, vertical residual error of aerial triangulation, accuracy of data acquisition of digital plotting (skill of digital plotting operator) and so on.

3) Lack of data (necessary data is obtained according to the specifications of digital mapping or not)

Lack of data will be occurred mainly at the stage of digital plotting. However, it is necessary to understand that all necessary data for digital topographic data/maps can not be obtained by digital plotting in digital photogrammetric mapping.

For example, the topographic features, artificial features and land use under the trees can not be seen in digital plotting system. Therefore, it is impossible to obtain such data in digital plotting.

Some kind of data necessary for digital topographic data/maps has to be collected by field identification and other method.

4) Attribute data (data is obtained according to the proper code number or not)

Necessary information should be obtained according to the proper code number on digital plotting stage.

However, the code numbering system among digital plotting data, GIS basic data and digital topographic data may be different. The code numbers of GIS basic data (for example, type of building and road, and so on) will be decided based on the filed identification.

Therefore, the accuracy of field identification and compilation of field identification results to GIS basic data are key point for the accuracy of attribute data of GSI basic data and digital topographic data.

5) Data structure (data structural errors such as undershoot, overshoot and so on exist or not)

Basically, data structuring such as polygon, data connection and so on will be executed at the stage of GIS basic data production.

However, at the stage of digital plotting, data have to be obtained in an appropriate manner (no overshoot, no undershoot, no double data, generation of proper node point and so on).

6) Map representation (map representation such as arrangement of annotation and

symbols, transposition, abbreviation, generalization and so on is suitable or not)

The preparation of digital topographic data according to the map specifications is the work of digital cartography section, and map representation has no relation with the prior works such as GIS basic data production and digital plotting.

To summarize the above-mentioned matters, the relation between work items of digital photogrammetric mapping and accuracy/quality of digital topographic data/maps can be shown in Table 9.5.1 "Relation between accuracy/quality and work items of digital photogrammetric mapping".

Among these six (6) factors, digital plotting work has an influence on five (5) factors.

Table 9.5.1 Relation between accuracy/quality and work items of digital photogrammetric mapping

Item	Horizontal accuracy	Vertical accuracy	Lack of data	Attribute data	Data structure	Map representation
Aerial photography	○	○	―	―	―	―
GCP survey	○	○	―	―	―	―
Aerial triangulation	○	○	―	―	―	―
Digital plotting	○	○	○	○	○	―
Field identification	―	―	○	○	―	―
Compilation of filed identification results	―	―	○	○	―	―
Data structuring (GIS basic data production)	―	―	―	○	○	―
Digital cartography	―	―	―	―	―	○

Note: ― No relation or little relation
○ Close relation

Before starting IDMS, many staff of SOB has no experience of actual works of digital photogrammetric mapping. Therefore, it is considered that the accuracy and quality of digital topographic data/maps produced by IDMS will be improved step by step through the implementation of digital photogrammetric mapping works of IDMS.

The accuracy and quality of digital topographic data/maps produced by IDMS can be evaluated by the comparison between the digital plotting data obtained in the 3rd year of BDMAP (beginning of digital plotting of IDMS) and the digital plotting data obtained in the 4th year of BDMAP.

9.5.1 Evaluation method for accuracy and quality of digital topographic data/maps

In general, the accuracy and quality of digital topographic data/maps will be evaluated based on the above mentioned six (6) factors.

As already described above, digital plotting work has an influence on five (5) factors among six (6) factors shown in Table 9.5.1 "Relation between accuracy/quality and work items of digital photogrammetric mapping".

This means that the accuracy and quality of digital topographic data/maps will mainly depend on the skill of digital plotting operators.

Therefore, volume of errors of digital plotting data (lack of data, code number mistakes, data structure mistakes, photo interpretation mistakes and so on) was selected as an indicator for the evaluation of project purpose of BDMAP (accuracy and quality of digital topographic data/maps produced by IDMS will be improved).

9.5.2 Volume of errors and error ratio of 1:5,000 scale digital plotting data

1:5,000 scale digital plotting of IDMS was started from around April 2012. The first 1:5,000 scale digital plotting sheet was No. 20 of Sylhet City.

1:5,000 scale digital plotting of No. 20 sheets of Sylhet City was completed on around the end of June 2012.

Immediately after the completion of 1:5,000 scale digital plotting of No. 20 sheet of Sylhet City, 1:5,000 scale digital plotting of No. 21 sheet of Sylhet City was started from July 2012, and completed on October 2012.

1:5,000 scale digital plotting of these two (2) sheets (No. 20 and No. 21) of Sylhet City was executed by the same digital plotting operator. Therefore, the digital plotting data of these two (2) sheets is a good material for the evaluation of accuracy and quality of 1:5,000 scale digital plotting data of IDMS.

The total data volume of digital plotting data of one (1) sheet will be different sheet by sheet. It is impossible to compare simply the total volume of errors and mistakes of these two sheets (sheet No.20 and No.21 of Sylhet City) for the evaluation of accuracy and quality of 1:5,000 scale digital plotting data.

Therefore, percentage of errors and mistakes of digital plotting data per sheet (error ratio per sheet) was used for the evaluation of 1:5,000 scale digital plotting data.

After the completion of 1:5,000 scale data acquisition by digital plotting operator, 1:5,000 scale digital plotting data was checked by the supervisor of digital plotting section of IDMS. The results of checking by the supervisor were used for the evaluation of accuracy and quality

of 1:5,000 scale digital plotting data.

The results of checking of accuracy and quality of 1:5,000 scale digital plotting data is shown in Table 9.5.2 “Check results of accuracy/quality of 1:5,000 scale digital plotting data”.

Table 9.5.2 Check results of accuracy/quality of 1:5,000 scale digital plotting data

Items	First digital plotting sheet (A)	Second digital plotting sheet (B)	Rate of change (B/A)
Sheet number	No. 20 (Sylhet City)	No. 21 (Sylhet City)	
Starting date of digital plotting	April 2012	July 2012	
Date of inspection	July 2012	November 2012	
Inspection items	Data structure	Data structure	
	Lack of data	Lack of data	
	Lack of symbol	Lack of symbol	
	Interpretation mistake	Interpretation mistake	
Number of node points (vertex)	36,159 points	42,848 points	1.18
Number of symbols	1,124 points	725 points	0.64
Total data volume (A)	37,293 points	42,573 points	1.14
Number of errors found (B)	592 points	72 points	0.12
Error ratio (B/A)	Approx. 1.45 %	Approx. 0.16 %	0.11

According to Table 9.5.2, the value of error ratio of the second digital plotting (sheet No. 21) is approximately 1/9 of the value of error ratio of the first digital plotting (sheet No. 20), even though the total data volume of the second digital plotting is approximately 18 % higher than the first digital plotting.

It is judged that the accuracy and quality of the 2nd sheet (sheet No. 21) of 1:5,000 scale digital plotting is higher than the first sheet (sheet No. 20) of 1:5,000 scale digital plotting.

Also, it is judged that the technical skill of this digital plotting operator was improved through the progress of actual digital plotting work.

However, it is necessary to discuss within SOB that the error ratio of 0.16 % is good enough for the accuracy and quality of digital plotting data or not.

9.5.3 Volume of errors and error ratio of 1:25,000 scale digital plotting data

Using the same method, volume of errors and error ratio of 1:25,000 scale digital plotting data was examined.

The first round of 1:25,000 scale digital plotting was completed by the end of August 2011. Immediately after the completion of data acquisition, these digital plotting data were checked by the supervisors of digital plotting section of IDMS.

The second round of 1:25,000 scale digital plotting was completed by the beginning of November 2011. These digital plotting data was also checked by the supervisors of digital plotting section of IDMS.

Based on the check results of the first round of 1:25,000 scale digital plotting data, volume of errors and error ratio of the first round digital plotting data were calculated.

Table 9.5.3 "Volume of errors and error ratio of the first round of 1:25,000 scale digital plotting data" shows the volume of errors and error ratio per half sheet of 1:25,000 scale digital plotting selected by random choice method.

Table 9.5.3 Volume of errors and error ratio of the first round of 1:25,000 scale digital plotting data

Item/Sheet No.	78O12D-2, 4	83D01-1, 2	78O16B-2, 4	78P09C-1, 2	78P09C-3, 4	78P13B-1, 2	Total
Volume of data	45,521	65,804	43,134	44,545	38,890	57,749	295,643
Volume of block	8,929	19,904	3,997	9,641	7,556	14,171	64,198
Total	54,450	85,708	47,131	54,186	46,446	71,920	359,841
Volume of errors	744	741	584	896	558	535	4,058
Average of error volume							**676**
Error ratio	0.01366	0.00865	0.01239	0.01654	0.01201	0.00744	0.07069
Average of error ratio							**0.01127**

Note: 1) "Volume of data" means volume of node points (vertex).
2) "Volume of block" means volume of symbols such as vegetation symbols.
3) Each inspected sheet is a 1/2 of 1:25,000 scale digital plotting sheet.
4) "Error" means lack of data, photo interpretation mistakes, data structure mistakes and so on.

In the same way, volume of errors and error ratio of the second round of 1:25,000 scale digital plotting data were calculated.

Table 9.5.4 "Volume of errors and error ratio of the second round of 1:25,000 scale digital plotting data" shows the volume of errors and error ratio per half sheet of 1:25,000 scale digital plotting data selected by random choice method.

Table 9.5.4 Volume of errors and error ratio of the second round of 1:25,000 scale digital plotting data

Item/Sheet No.	78G09B-1, 2	78G09B-3, 4	78G10C-1, 2	78G10C-3, 4	78G07C-1, 2	78G07C-3, 4	Total
Volume of data	84,756	69,948	82,176	15,424	65,366	83,723	401,393
Volume of block	23,015	22,326	23,533	5,298	17,720	21,406	113,298
Total	107,771	92,274	105,709	20,722	83,086	105,129	514,691
Volume of errors	521	215	311	193	504	244	1,998
Average of error volume							**333**
Error ratio	0.00483	0.00233	0.00294	0.00931	0.00607	0.00232	
Average of error ratio							**0.00386**

Note: 1) "Volume of data" means number of node points (vertex).
2) "Volume of block" means number of symbols such as vegetation symbols.
3) Each inspected sheet is a 1/2 of 1:25,000 scale digital plotting sheet.
4) "Error" means lack of data, photo interpretation mistakes, data structure mistakes and so on.

By the comparison with error ratio of the first round and the second round of 1:25,000 scale digital plotting data, error ratio of the second round of digital plotting data becomes 1/3 of error ratio of the first round of digital plotting data.

Therefore, it is considered that accuracy and quality of 1:25,000 scale digital plotting data of IDMS were improved.

However, it is judged that error ratio of the second round of digital plotting data is still high, and error ratio of 1:25,000 scale digital plotting data has to be decreased less than 0.1 %.

Based on Table 9.5.4 "Number of errors and error ratio on the second round of 1:25,000 scale digital plotting data", following two (2) values will be calculated.

a) Volume of errors ÷ Average of error volume
b) Error ratio ÷ Average of error ratio

Based on the above calculated two (2) values, the accuracy and quality of the second round of 1:25,000 scale digital plotting data can be classified as three (3) categories as follows:

1) Both "Volume of errors" and "Error ratio" in one sheet are below an average values.
⇒ Both calculated values will become less than "1.0".
⇒ It is judged that data acquisition accuracy is "Good" or "Improved".

78G09B-3, 4: Volume or errors ÷ Average of errors = 0.6456

Error ratio ÷ Average of error ratio = 0.6036

78G10C-1, 2: Volume of errors ÷ Average of errors = 0.9339
Error ratio ÷ Average of error ratio = 0.7616

78G07C-3, 4: Volume of errors ÷ Average of errors = 0.7327
Error ratio ÷ Average of error ratio = 0.6010

2) Either "Volume of errors" or "Error ratio" in one sheet is over an average values.
   ⇒ One of calculated values will become over "1.0", other will become less than "1.0".
   ⇒ It is judged that data acquisition accuracy is "An unstable condition".
   78G10C-3, 4: Volume of errors ÷ Average of errors = 0.5795
   Error ratio ÷ Average of error ratio = 2.4119

3) Both "Volume of errors" and "Error ratio" in one sheet are over an average values.
   ⇒ Both calculated values will become over "1.0".
   ⇒ It is judged that the data acquisition accuracy is "Bad" or "Not so improved".

78G09B-1, 2: Volume of errors ÷ Average of errors = 1.5645
Error ratio ÷ Average of error ratio = 1.2512

78G07C-3, 4: Volume of errors ÷ Average of errors = 1.5135
Error ratio ÷ Average of error ratio = 1.5725

Figure 9.5.1 "Evaluation of data acquisition accuracy of 1:25,000 scale digital plotting" shows the results of above calculation.

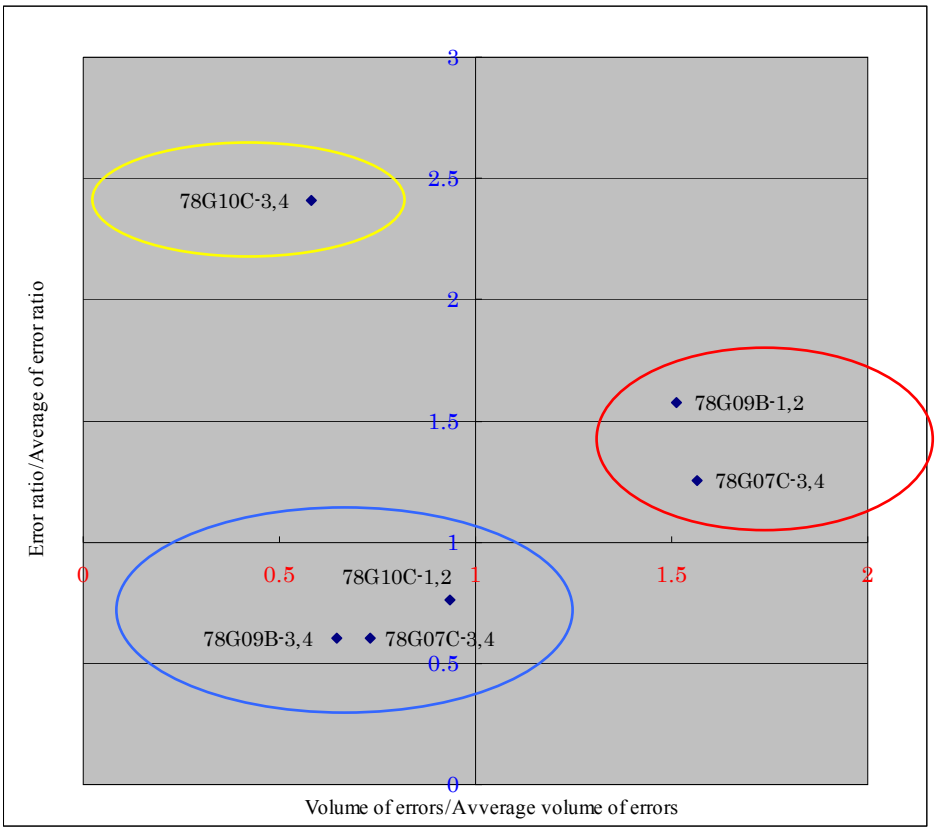


Figure 9.5.1 Evaluation of data acquisition accuracy of 1:25,000 scale digital plotting

The data acquisition accuracy of digital plotting operators of sheet numbers framed by blue color circle is judged as “Good” or “Improved”.

The data acquisition accuracy of digital plotting operators of sheet numbers framed by red color is judged as “Bad” or “Not so improved”.

Meanwhile, the data acquisition accuracy of digital plotting operators of sheet numbers framed by yellow color circle is judged as “Unstable”.

9.5.4 Relative evaluation of the accuracy of 1:25,000 scale digital plotting data from the view point of standard deviation

The relative evaluation of the accuracy of 1:25,000 scale digital plotting data from the view point of standard deviation of error volume is as follows:

The total data volume per sheet is different sheet by sheet. Therefore, the volume of error of each sheet can not directly be used for the calculation of standard deviation of errors volume.

Therefore, it is necessary to convert the error volume of each sheet to the error volume based

on the average data volume by under-mentioned formula.

Formula:
Error volume based on the average data volume
= Average data volume ÷ Data volume of each sheet × Error volume of each sheet

The calculated error volume based on the average data volume is shown in Table 9.5.5 "Error volume based on the average data volume".

Table 9.5.5 Error volume based on the average data volume

Item/Sheet No.	78G09B-1, 2	78G09B-3, 4	78G10C-1, 2	78G10C-3, 4	78G07C-1, 2	78G07C-3, 4	Total
Data volume	107,771	92,274	105,709	20,722	83,086	105,129	514,691
Average of data volume							85,782
Volume of errors	521	215	311	193	504	244	1,998
Error volume based on the average data volume (B)	415	200	252	799	520	199	2,385
Average of error volume (A)							**397**

The standard deviation of error can be calculated using "Error volume based on the average data volume (B)" and "Average of error volume (A)" by under-mentioned formula, and the value of standard deviation (σ) becomes "214".

Formula: Standard deviation $(\sigma) = \sqrt{(\sum(A - B)^2 / n)}$

A = Average of error volume based on the average data volume

B = Error volume based on the average data volume

n = Number of sheet

The relation among "Average value" and "Average value ±0.6745σ" are as shown in Figure 9.5.2 "Relation between "Normal distribution curve and standard deviation". Statistical speaking, 25 % of samples will be distributed to each range.

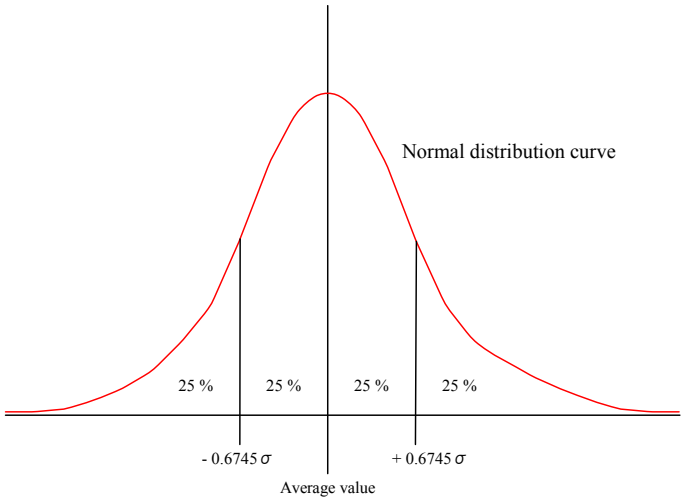


Figure 9.5.2 "Relation between normal distribution curve and standard deviation"

Figure 9.5.3 "Relative evaluation of the accuracy of 1:25,000 scale digital plotting data" shows the relation among "Average of error volume", "Error volume of each sheet" and "± 0.6745 × σ (Standard deviation)".

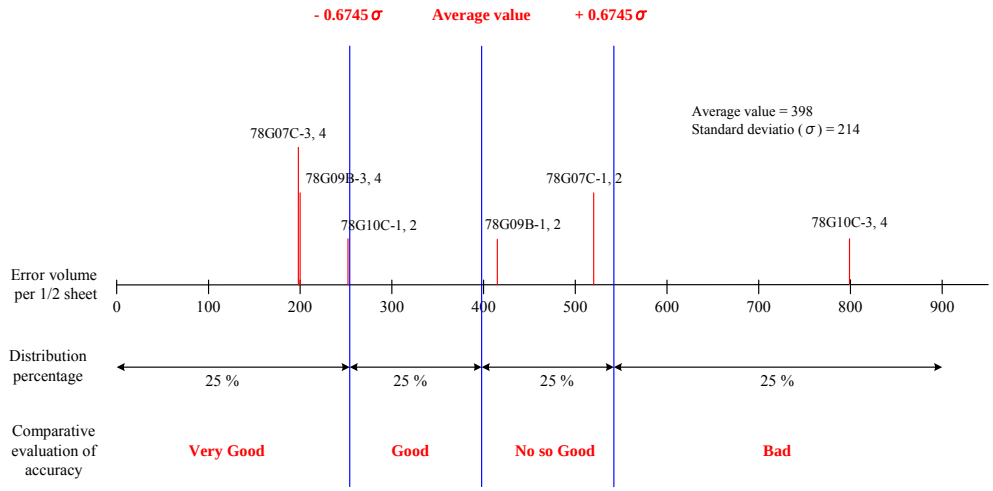


Figure 9.5.3 "Relative evaluation of the accuracy of 1:25,000 scale digital plotting data"

Based on the above Figure 9.5.3, the relative evaluation of the accuracy of 1:25,000 scale digital plotting data per sheet will be as follow:

Relative evaluation	Sheet Number		
Very Good	78G07C-3, 4	78G09B-3, 4	78G10C-1, 2
Good			
No so Good	78G09B-1, 2	78G07C-1, 2	

Bad 78G10C-3, 4

The error volume of digital plotting data of sheet number 78G10C-3, 4 (Value = 799) is higher than "the volume of average of error plus the value of standard deviation (397 + 214 = 611)". Therefore, the accuracy of digital plotting data of sheet number 78G10C-3, 4 was analyzed as "Very Bad".

Note: Statistical speaking, 68% of samples will be distributed within the range of "Average value ± 1σ", and 95% of samples will be distributed within the range of "Average value ± 2σ".

9.5.5 Important points of horizontal and vertical accuracy check

At the time of horizontal and vertical accuracy inspection of digital topographic data/maps, it is necessary to take account of the following points:

1) Different data source must be used for inspection.

For the inspection of horizontal and vertical accuracy of digital topographic data/maps, the data to be used for inspection have to be prepared based on the different data source.

In case the data source (e.g. aerial photos, aerial triangulation results and so on) to be used for inspection and data to be inspected are same, the difference of technical skill of operators will be evaluated.

2) Accuracy of data to be inspected ＜ Accuracy of data to be used for inspection

The accuracy of data to be used for inspection has to be higher than the accuracy of data to be inspected.

This is an absolute requirement for the inspection of horizontal and vertical accuracy of digital topographic data/maps.

In case the accuracy of data to be used for inspection and the accuracy of data to be inspected are same, it is impossible to inspect the horizontal and vertical accuracy of digital topographic data/maps.
From the viewpoint of theory of accuracy, the accuracy to be used for inspection has to be several times higher (if possible, more than ten times) than the accuracy of data to be inspected.

9.5.6 Horizontal accuracy

In general, following three methods will be used for the inspection of horizontal accuracy of

digital topographic data/maps which will be prepared by digital photogrammetric mapping.

1) Estimation from the residual errors of GCP of aerial triangulation

Horizontal accuracy of digital topographic data/map will be estimated from the values of residual errors of GCP of aerial triangulation.

In this method, horizontal errors which will be occurred during the operation of digital plotting (i.e. technical skill of digital plotting operator) will not be counted. Therefore, this estimation can be used only as a guide.

2) Inspection by ground survey method

Several points which are clearly identified on digital topographic data/maps (e.g. corner of large building, road intersection and so on) will be selected, and these horizontal coordinates will be observed by ground survey method such as GPS observation, traversing and so on.

Horizontal coordinates from digital topographic data/maps and horizontal coordinates which will be observed by ground survey method will be compared.

In this method, it is possible to inspect only the points to be selected for inspection.

Therefore, it is impossible to evaluate the accuracy of horizontal position of the remaining area of digital topographic data/maps by this method.

3) Inspection by photogrammetric method

Re-photogrammetric mapping for inspection area will be executed by the different digital plotting operators, and original and re-photogrammetric mapping data will be compared.

In this method, it is possible to evaluate the average (overall) horizontal accuracy of digital topographic data/maps in the inspection area.

An absolute requirement in this method is that the technical skill of the operators for re-photogrammetric mapping must be higher than the technical skill of operators who made the data to be inspected.

In case the data source (e.g. aerial photo, aerial triangulation) is same, this method is just to evaluate the difference of technical skill of digital plotting operators.

However, method of 1) is just rough estimation of horizontal accuracy of digital topographic data/maps.

Method of 3) has an issue that it is difficult to obtain the different data sources such as aerial photo, aerial triangulation data and so on.

Accordingly, the method commonly used for inspection of horizontal accuracy of digital topographic data/maps is the method of "2) Inspection by ground survey method".

It is recommended that SOB will inspect the horizontal accuracy of digital topographic data/maps which will be prepared by IDMS randomly by ground survey method using GPS, because BDMAP has no ground survey equipment necessary for the inspection.

9.5.7 Vertical accuracy

In general, following three methods will be used for the inspection of vertical accuracy of digital topographic data/maps which will be prepared by digital photogrammetric mapping.

1) Estimation from the residual errors of GSP of aerial triangulation

Vertical accuracy of digital topographic data/map will be estimated from the values of residual errors of GCP of aerial triangulation.

In this method, the vertical errors of spot heights and contour lines which will be occurred during the operation of digital plotting (e.g. technical skill of digital plotting operator) will not be counted. Therefore, this estimation can be used only as a guide.

2) Inspection by ground survey method

The spot height points which are clearly identified on digital topographic data/maps (i.e. road intersection and so on) will be selected, and these vertical heights will be observed by ground survey method such as direct or indirect leveling.

The elevation of spot height points on digital topographic data/maps and the elevation which will be obtained by ground survey method will be compared.

In this method, it is possible to inspect only the points to be selected for inspection.
Therefore, it is impossible to evaluate the vertical accuracy of the remaining area of digital topographic data/maps by this method.

3) Inspection by photogrammetric method

Re-photogrammetric mapping (in an ordinary way, contour lines and spot heights only) for inspection area will be executed by the different operators, and original and re-photogrammetric mapping data/maps will be compared.

In this method, it is possible to evaluate the average (overall) vertical accuracy of digital topographic data/maps.

An absolute requirement in this method is that technical skill of operators for re-photogrammetric mapping must be higher than technical skill of operators who made the data to be inspected.

In case the data source (i.e. aerial photo, aerial triangulation) is same, this method is just to evaluate the difference of technical skill of operators.

However, method of 1) is the rough estimation of vertical accuracy of digital topographic data/maps.

Method of 3) has an issue that it is difficult to obtain the different data sources such as aerial photo, aerial triangulation data and so on.

Accordingly, the method commonly used for inspection of vertical accuracy of digital topographic data/maps is the method of "2) Inspection by ground survey method".

It is recommended that SOB will inspect vertical accuracy of digital topographic data/maps which will be prepared by IDMS randomly by leveling, because BDMAP has no ground survey equipment necessary for the inspection.

9.5.8 Map representation and marginal information

After completion of works of digital cartography section including check and correction of digital topographic data/maps, map representation and marginal information of 1:25,000 and 5,000 scale digital topographic data/maps prepared by IDMS were inspected by QC section of SOB.

BDMAP executed to check the methodology of checking and correction executed by Digital Cartography Section of IDMS, and indicated the issues and points to be improved of checking and correction method by Digital Cartography Section of IDMS.

The details of checking results of 1:25,000 and 1:5,000 scale digital topographic data/maps are shown in "Inspection Results of 1:25,000 Scale Digital Topographic Maps" and "Inspection Results of 1:5,000 Scale Digital Topographic Maps" of "Textbook and Other Document".

Chapter 10 Issues to be tackled by SOB

Chapter 10 Issues to be Tackled by SOB

The issues to be solved by SOB are as follows:

10.1 The Peter Principle and SOB

10.1.1 What is the Peter Principle?

The Peter Principle was formulated by Laurence J. Peter and Raymond Hull in their 1969 book "The Peter Principle".

The Peter Principle is a proposition that states the members of an organization, and consists of the following two (2) prior condition and three (3) principles.

Prior condition-1
The target organization of the Peter Principle is an organization with hierarchy structure.

Prior condition-2
The person who belongs in this organization will be promoted to next level's hierarchy, in case the job of present level's hierarchy done well.

What will be occurred in this kind of organization?

Principle-1
Members of a hierarchical organization eventually are promoted to their highest level of competence, after which further promotion raises them to incompetence. That level is the employee's "level of incompetence" where the employee has no chance of further promotion, thus reaching their career's ceiling in an organization.

Principle-2
As time passes, an incompetent employee is still employee with no title, and competent employee will be promoted up to "level of incompetence". As a result, the number of incompetent employees of all hierarchical levels of organization will increase.

Principle-3
The works will be accomplished by those employees who have not yet reached their level of incompetence".

In an organization structure, the Peter Principle's practical application allows assessment of the

potential of an employee for a promotion based on performance in the current job.

Members of a hierarchical organization eventually are promoted to their highest level of competence, after which further promotion raises them to incompetence.

That level is the employee's "level of incompetence" where the employee has no chance of further promotion, thus reaching their career's ceiling in an organization.

The employee's incompetence is not necessarily a result of the higher-ranking position being more difficult.

It may be that the new position requires different work skills which the employee may not possess.

For example, an engineer with great technical skill might get promoted to project manager, only to discover he or she lacks the interpersonal skill required to lead a team. Thus, work is accomplished by those employees who have not yet reached their level of incompetence.

The period from 1969 to the 1970s, when Peter wrote this book, was high economic growth period in U.S.A. and also Japan. The basis of promotion of employees of organization was permanent employment and promotion by seniority.

Accordingly, in addition to the above mentioned two (2) prior conditions, following prior condition must be added for the Peter Principle.

Prior condition-3
Target organization is a hierarchical organization with permanent employment system.

A permanent employment system in U.S.A. started to collapse on the 1980s. This was a period of economic war between U.S.A. and Japan, and the manufacturing business of U.S.A. slipped into recession.

Also, a permanent employment system in Japan started to collapse on the 1990s, after bubble economy collapse.

Both in U.S.A. and Japan, during the period of permanent employment system, employee was promoted in case that employee belonged to the same organization, and demotion was a rare case.

The Peter Principle was proposed on the above-mentioned historical background.

After collapse of permanent employment system, an ability-based system became popular. Demotion of employee became common practice and many managers were occupied by career changers.

Therefore, the situation described by the Peter Principle can not be found in the organizations of both in U.S.A. and Japan now.

Now in Japan, a permanent employment system is not applied by many organizations. And, especially many young generations has no idea to work in a same organization up to the age of retirement.

Due to the change of social conditions, the Peter Principle is already out of fashion both in U.S.A. and Japan. However, it is considered that the Peter Principle does not become invalid even now.

Peter suggested a method to mitigate the risk associated with the Peter Principle.

One way that organization can avoid this effect is to refrain from promoting a worker until he or she shows the skills and work habits needed to succeed at the next higher job. Thus, a worker is not promoted to manager and other positions if they do not already display management abilities.

1) The first corollary is that employees who are dedicated to their current jobs should not be promoted for their competence, but should be rewarded with “pay rise”, and remained in their current position. The persons with poor incompetence of their current job should not be promoted.

2) The second corollary is that employees might be promoted only after being sufficiently trained to the new position. By this method, it is possible to find the persons with poor managerial capabilities before they are promoted.

In business world, the person who has a prominent technology is more valuable than the incompetent manager. Therefore, many organizations in private sector have separate promotion and wage system (one for employees of the administrative divisions and other for employees of technical divisions).

Another technique for overcoming the effects of the Peter Principle can be found in the use of contractors. Contractors of information technology are selected for their relevant experience, supported by recent references, and are usually taken on for short period. If incompetence is detected, they can be easily laid off (e.g. by simply not renewing their contract).

The contractor is not a part of the hierarchy, is not usually eligible for promotion, and is well remunerated and thus content with the contracted position, as well as being under pressure to perform to ensure continued employment.

10.1.2 Is it possible to apply the Peter Principle to SOB?

Is it possible to apply the Peter Principle to SOB or not?

At first, it is necessary to verify that SOB fulfills all pre-conditions of the Peter Principle or not.

Prior condition-1: Yes
SOB is an organization with hierarchy structure.

Prior condition-2: Yes
SOB has a promotion system.

Prior condition-3: Yes
Employment system of SOB is a permanent employment system same as other government organization in Bangladesh.

As mentioned above, SOB satisfies all prior conditions of the Peter Principle. Therefore, it is judged that three (3) principles of the Peter Principle can be applied to SOB.

This means that many managers (middle class staff) of SOB are incompetent. As already explained above, "incompetent" means that he or she has no abilities necessary for manager, and does not mean that he or she has no abilities necessary for the position before promoted.

In fact, many middle class staff of SOB has no abilities necessary for manager such as planning and management abilities, staff management ability, trouble shooting ability and so on.

10.1.3 How to mitigate the risk associated with the Peter Principle

As already mentioned above, Peter suggested a method, which organization can use, to mitigate the risk associated with the Peter Principle.

Peter suggested that the employee must be promoted only after being sufficiently trained to the new position. For example, the employee who has no staff management capability will not be promoted to manager and so on.

This means that technical capability and staff management capability are completely different types of capability. Often, it is found that the person who has high technical capability, but completely lacking the planning and management capabilities, especially staff management capability in many organizations.

To mitigate such situation, it is necessary to change the promotion system from "overemphasis on academic qualification system" to "ability-base system".

It is estimated that the incompetent manager was promoted only by the academic qualification, and has not enough technical capability, and planning and management capability for the implementation of project.

In time of peace (time without project), it is estimated that the existence of such incompetent manager will not bring on serious issue to an organization.

However, in wartime (time of project), the existence of such incompetent manager (i.e. platoon leader or company leader) will bring on serious issue to an organization (at the time of fighting, platoon or company will be wiped out).

10.2 1 person × 4 months ≠ 4 persons × 1 month

When survey and mapping plan is made, the unit of "man day" or "man month" is used.

The unit of "man day" or "man month" is very useful for cost estimation, cost management and so on. However, few people understand clearly that "1 person × 4 months" is not equal to "4 persons × 1 month".

This kind of calculation is effective for manual labor or unskilled labor such as street cleanup and so on.

Following formula can be applied for this kind of works.

Work period = Volume of work ÷ (Number of person × productivity)

Because, manual labor or unskilled labor is parallel activities (repeat of same activities).

However, many office works, especially the work of information business, are not parallel activities, and above formula can not be applied to this type of work.

For example, in case someone requests his or her staff to help him or her, following actions have to be taken.

1) Instruction to the staff
2) Preparation of equipment, software, documents and so on
3) Reply to the question from the staff
4) Arrangement for work consistency
5) Progress check
6) Quality check

Finally, the percentage of reduction of his or her works may be an approximately 30～50 % of his or her works.

Therefore, in case the work of "1 person × 1 month = 1 man month" is executed by two (2) persons, the necessary man month for this work may be approximately 1.5 man month.

10.3 90 % syndrome issue of digital mapping project

Digital photogrammetric mapping consists of several works such as aerial triangulation, digital plotting, digital compilation and so on. Also each work consists of following three steps.

1) First step: Planning and preparation
2) Second step: Main work such as data acquisition, compilation and so on
3) Third step: Data checking and correction

Estimation of work period and necessary volume of manpower are important key factors for the planning of digital photogrammetric mapping project.

After starting actual works of project, it may be found that the actual volumes of "First step: planning and preparation", and "Third step: data checking and correction" become bigger than the estimated volumes which were estimated before the implementation of the project.

Furthermore, it may be found that the discrepancy between the actual and estimated volumes of "First step: planning and preparation" and "Third step: Data checking and correction" is relatively bigger than the discrepancy between the actual and estimated volume of "Second step: main work such as data acquisition, compilation and so on".

In case the actual volumes of work period and manpower of 1) First step, and 3) Third step, are over the estimated volumes to a large degree, it is difficult to catch up on the delay of schedule.

For example, it is assumed that one (1) digital plotting operator will execute one (1) sheet of digital plotting (data acquisition) in one (1) month.

For digital plotting (data acquisition) of nine (9) sheets by one (1) digital plotting operator, it will take nine (9) months by simple arithmetic. This calculation maybe comes into effect.

At this moment, an incompetent manager considers that it is possible to complete nine (9) sheets of digital plotting (data acquisition) by nine (9) digital plotting operators in one (1) month.

However, this calculation surely comes into effect or not? (Refer to Figure 10.3.1 "Difference of working period of digital plotting".)

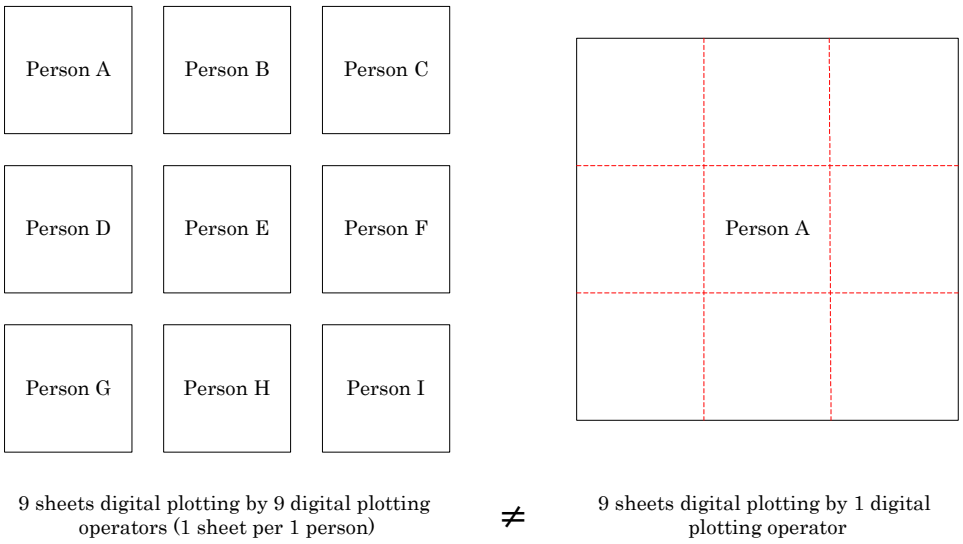


Figure 10.3.1 Difference of working period of digital plotting

Maybe, the answer is "No". So, "1 person × 9 months ≠ 9 person × 1 month".

In case that nine (9) digital plotting operators engaged in digital plotting at the same time, the issues by the individual differences of data acquisition accuracy and photo interpretation among digital plotting operators, data adjustment between the adjacent sheets, and so on will be occurred. Thus, substantial amount of works for data checking, correction and adjustment will be necessary.

Furthermore, an operational guidance to the digital plotting operators before and during the implementation of digital plotting will be necessary.

Meanwhile, in case that one (1) digital plotting operator executes digital plotting of nine (9) sheets, the issues by the individual differences of data acquisition accuracy and photo interpretation caused by the different digital plotting operators will not be occurred.

In this case, nine (9) sheets of digital plotting data will be obtained as seamless data. Therefore, generally, checking and adjustment digital plotting data between the adjacent sheets will not be necessary.

The digital plotting work will be executed by one (1) digital plotting operator. Therefore, it is considered that the operational guidance to the digital plotting operator before and during the implementation of digital plotting is not so necessary.

The accuracy of data acquisition and photo interpretation of digital plotting fully depends on the abilities of digital plotting operators. In case the abilities of digital plotting operators are low, the volume of data to be corrected will increase, and the time for checking and correction will also drastically increase.

As a result, it is estimated that the work period for nine (9) sheets digital plotting by nine (9) digital plotting operators is approximately 1.5 months or 2.0 months in the worst case.

This situation can be found through all works of digital photogrammetric mapping, especially at digital plotting.

One of main issues of IDMS is the delay of works, especially the situation that 90 % of work is completed, but remaining 10 % of work can not be finished for a long time.

This situation is called as “90 % syndrome issue” in the sphere of project management (refer to Figure 10.3.2 “90 % syndrome issue on digital mapping project”).

From the view point of progress management, this “90 % syndrome issue” is a major challenge in IDMS.

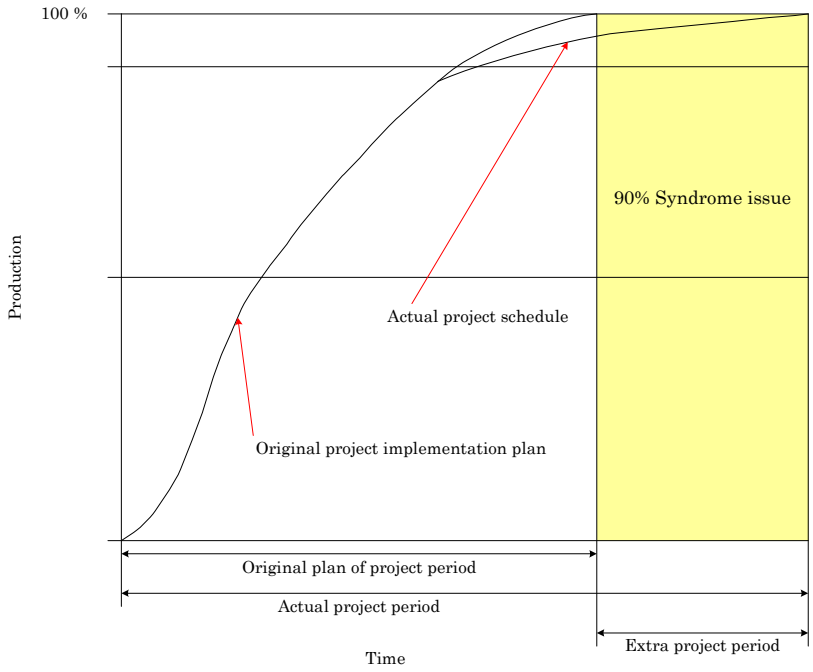


Figure 10.3.2 90 % syndrome issue on digital mapping project

Frankly speaking, it is difficult to solve this "90 % syndrome issue" of IDMS by SOB.

At the beginning, preparation of proper work schedule is essential, but vastly work experience is necessary for preparation of proper work schedule.

At the same time, proper quality control and progress management are necessary for the implementation of project, and also a wide knowledge and experience are essential for quality control and progress management.

Unfortunately, many middle class staff of SOB has no abilities of project planning, accuracy and quality control, progress management and also the experience of actual work of digital photogrammetric mapping before implementation of IDMS.

The knowledge of these staff of SOB is "Book knowledge" which is the knowledge obtained only from text book, and not a knowledge based on own experience.

"Book knowledge" is of limited use for the planning, management and implementation of project (actual works) in many cases.

It is necessary to understand that the project (actual works) can not be implemented and managed by the person who has only an academic background without the experience of actual works.

Therefore, it is necessary to raise the ability level of the middle class staff (manager class) of SOB to obtain not only the knowledge of technical theory, but also the experience of actual works, planning and management abilities according to the program.

10.4 What will occur by the transition from analogue to digital?

From a view point of technology improvement, methodology of topographic mapping was developed as follows:

1) From a long time ago, topographic map was prepared all over the world, and prepared by ground survey method for a long time.

2) The method of photogrammetric mapping using aerial photos (analogue method) became popular from around the middle of or after World War II.

3) Ground survey was executed mainly by leveling, trigonometric survey, traversing and plain table survey and so on for a long time. However, due to the development of electro-optical distance meter, total station and GPS, the survey accuracy and working efficiency were drastically improved.

4) Due to the reason of development of computer and software relevant to the photogrammetric mapping, analogue photogrammetric mapping method sifted to digital photogrammetric mapping gradually from the 1990s.

5) Aerial camera also shifted from analogue camera (film base camera) to digital camera from the beginning of the 2000s gradually. Currently, analogue camera is rarely used for aerial photography.

From another point of view, an advancement of technology and equipment means as follows:

1) Due to the transition of mapping method from ground survey method to photogrammetric mapping method, significant work volume of ground surveyor related to topographic mapping was decreased.

2) The advancement and development of survey equipment such as electro-optical distance meter, total station and GPS improved work efficiency of ground survey works, and work volume of ground surveyor decreased moreover.

3) Due to the transition of mapping method from analogue photogrammetric mapping to

digital photogrammetric mapping, work of tracing and scribing (last stage of analogue topographic mapping method) was disappeared completely, and tracer and scriber became jobless persons.

4) Due to the transition of aerial camera from analogue camera to digital camera, work of photo processing (film development and printing) was disappeared mostly, and persons engaging photo processing became jobless persons.

5) Due to the transition of mapping method from analogue mapping to digital mapping, persons who have no knowledge of computer and software concerning digital mapping became incompetent engineers or operators.

6) Due to the development of computer technology, new jobs or engineers such as network engineer, server engineer, programmer, system engineer, software development engineer and so on became necessary.

In sum, technology development in every field means that some traditional jobs will be disappeared and new jobs will be created.

By the implementation of IDMS, SOB shifted topographic mapping method from ground survey method to digital photogrammetric mapping method skipping a step of analogue photogrammetric mapping method.

The development and advancement of technology has a cold/cruel aspect in a certain sense. The jobs belonging to persons who can not catch up with the development and advancement of technology will disappeared suddenly, and as a result, such persons will lose their jobs or their positions in an organization.

The staff of SOB has to understand this situation clearly, and also SOB has to consider the treatment of the staff that can not catch up with the development and advancement of technology.

At the same time, it is necessary to change the recruitment standards of SOB suitable for the circumstances of digital mapping era.

In simple terms, it is necessary to modify the organization structures and qualification of the staff of SOB to fit the digital mapping era immediately.

However, SOB is an organization of government sector of Bangladesh, and it is impossible to dispense with surplus personnel’s service.

Therefore, alteration of generations of SOB has to be executed only by natural decrease and age-limit retirement of staff of SOB gradually.

10.5 Future Vision of SOB

10.5.1 Transition of national survey and mapping organization

It is considered that the rolls and activities of national survey and mapping agency of all countries of the world show the following tendency.

1) National survey and mapping agencies in the advanced countries were started as a survey and mapping implementing agency. However, at the present day, national survey and mapping agency is a planning and management agency for survey and mapping, research, supply and management of data/maps and so on. Many survey and mapping works such as updating of topographic data/maps and so on are executed by outsourcing.

2) National survey and mapping agencies in the developing countries also started from an implementing agency of survey and mapping. However, some of survey and mapping agencies in the developing countries are now sifting from an implementing agency to a planning and management agency.

3) It is considered that technological level and capacity of survey and mapping production in private sector in such countries already reached at a certain level. These countries are found in the countries of Central and South America and ASEAN members.

4) In the developing countries, that technological level and capacity of survey and mapping production in private sector in the countries are low or private sector concerning survey and mapping does not exist, national survey and mapping agency has no other choice to act as an implementing agency of survey and mapping production.

5) The above-mentioned current of national survey and mapping agency has a strong relationship with the policy of the government. In general, even though the demand of survey and mapping increases in a country, the budget of the government concerning survey and mapping will not be increased so much.

   Therefore, it is considered that the pressure of demand and low labor efficiency of the government sector will carry out the reform of social structures to more efficient one.

From the above view point, SOB is an implementing agency of survey and mapping in the

Government of Bangladesh at present.

10.5.2 Situation of survey and mapping private sector in Bangladesh

The present situation of private sector concerning survey and mapping in Bangladesh is as follows:

1) It is considered that number of private companies having the capability and equipment necessary for digital photogrammetric mapping (3D data acquisition method) in Bangladesh is one (1).

2) It is considered that this company has an experiences of large scale digital topographic data/maps production, but has little experience of medium to small scale digital topographic data/maps production.

3) It is considered that main clients of this company are European private companies, and this company has little experience of photogrammetric mapping project in Bangladesh.

4) It is considered that other private companies in Bangladesh has no capabilities and equipment necessary for digital photogrammetric mapping (3D data acquisition method), but have a capabilities and equipment for large scale mapping by ground survey method and GIS data production.

The main reason of the above-mentioned situation of private sector concerning survey and mapping in Bangladesh, especially only one (1) private company in Bangladesh has a capabilities and equipment of digital photogrammetric mapping (3D data acquisition method), is a restriction for use of aerial photos in Bangladesh.

It is sure that aerial photos and topographic maps have a close relationship with national defense. However, presently, precise digital satellite images can be seen freely on Google Earth all over the world, and also it is possible to purchase such a precise digital satellite image (50 cm ground resolution or more) without any restriction.

Therefore, it is presumed that the importance level of aerial photos on national defense at present was descend from the age before Google Earth and high resolution satellite images grow popular.

Considering the transition of national survey and mapping agencies in the advanced countries and also ASEAN members, it is considered that SOB will gradually sift from an implementing agency to a planning and management agency at some future time.

10.5.3 Transition of GSI Japan

The transition of GSI Japan, national survey and mapping agency in Japan, is as follows:

1) In 1888, Japanese Imperial Land Survey was established as an under-organization of General Staff Office of Imperial Japanese Army in Japan.

2) 1:50,000 scale topographic map production was started from 1890 and almost completed in 1924.

3) As a framework of topographic mapping in Japan, approximately 38,000 triangulation points (1^{st} order～3^{rd} order) were established by 1920.

4) After World War II, the roles and activities of Japanese Imperial Land Survey were transferred to Geographical Survey Institute in Japan (GSI Japan) established in 1945 as an under-organization of the Ministry of Home Affairs in Japan.

5) In 1948, GSI Japan was transferred from the Ministry of Home Affairs to the Ministry of Construction in Japan.

6) Name of "Geographical Survey Institute of Japan" was changed as "Geospatial Information Authority of Japan" in 2000.

GSI Japan executed the works of establishment of geodetic control points, production and updating of national topographic maps and so on by the staff of GSI Japan at the beginning.

Due to the economic development in Japan, work volume of GSI Japan increased and overflowed year by year. However, it was impossible to increase the total number of government staff with no restriction. Therefore, some work of GSI Japan was executed by outsourcing step by step.

The transition of GSI Japan may serve as a useful reference for the prospect of future aspect of SOB.

The key factors for the prospect of future aspect of SOB are as follows:

1) At the beginning, the staff of SOB has to have enough capabilities of not only technical aspects, but also planning and management, and knowledge of cost estimation of survey and mapping in private sector.

2) Secondarily, private survey and mapping companies having enough capabilities and equipment and also numbers of engineers and surveyors have to remain in existence in Bangladesh.

   If not, huge amount of budget of the Government of Bangladesh have to be paid to foreign private companies always at the time of implementation of digital photogrammetric mapping project and so on in Bangladesh.

3) Thirdly, it is necessary to categorize the works of SOB as follows:

   - The works necessary to be implemented by SOB themselves.
   - The works can be implemented by outsourcing from the view points of economic efficiency, work schedule and so on.

4) Fourth, in case SOB shifts from an implementing agency to a planning and management agency of geospatial data/maps, it is necessary to reconstruct the organization and personal composition of SOB to fit the roles of future SOB gradually.

10.5.4 Reexamination of organization structure of SOB

It is considered that the present organization structure and personnel composition of SOB is out of fashion from the view point of roles of SOB and technology of digital era.

Also, it is considered that the present organization structure and personnel composition of SOB were basically made based on the technology of analogue topographic mapping by ground survey method.

Therefore, it is recommended to review the present organization structure and personnel composition of SOB, and also to sift a new organization structure and personnel composition which are appropriate to future roles of SOB and also to the digital era.

The issues of present organization structure and personnel composition of SOB are as follows:

1) The authorized fixed number of staff of SOB at present is 893 persons. Approximately 1/3 of authorized fixed number of staff of SOB (more than 300 persons) belongs to the field survey parties (excluding geodetic department).

   It is considered that the main jobs of the field survey parties are field works for revision of the existing topographic maps (mainly 1:50,000 scale topographic maps) and establishment of geodetic network and so on.

However, after the transition of topographic mapping and revision survey method from ground survey method to digital photogrammetric mapping method, it is considered that the work volume of the field survey parties of SOB will decrease and the field survey parties will be overmanned.

2) For digital photogrammetric mapping, operation and maintenance of computers, software, server, network system and so on are essential. However, in the present organization of SOB, it is not clear which section of SOB has a responsibility for these jobs.

3) In the present organization of SOB, it is not clear which section has a responsibility for management, storage and delivery of digital data such as digital topographic data and GIS basic data, digital image of aerial photos and so on.

4) It is necessary to strengthen the function and capability of data distribution section in SOB from the view point of effective and efficient use of geospatial data and so on for national development of Bangladesh.

5) In the present organization in SOB, there is no section which is responsible for technical development of digital photogrammetric mapping and also new technology concerning geospatial data.

6) There is a training party in the present organization in SOB. However, functional capability for digital photogrammetric mapping and computer technique are not enough.

7) In the present organization of SOB, there is no GIS section responsible for the production of GIS basic data.

The biggest issue concerning the organization structure and personnel composition of SOB is item 1) of above.

Especially, many staff of the field survey parties of SOB has not enough knowledge and experiences of computer and basic software, and also outline of photogrammetric mapping.

Therefore, it seems to be difficult to relocate the staff of the field survey parties, especially middle-aged or older staff, to other sections with minor exceptions.

Many staff of the field survey parties are participating in IDMS for office works such as digital plotting, GIS basic data production and also cartography works.

It is estimated that the staff with the worst working attitude in office works such as digital

plotting, GIS basic data production and digital cartography in IDMS are the persons participating from the field survey parties.

It is considered that they have a conscious of a feeling that the jobs of IDMS such as digital plotting, GIS basic data production and digital cartography are not their primary jobs and they are engaging in an additional works.

This is the main reason of bad attitude of the staff participating from the field survey parties in IDMS.

However, mapping method of SOB was already shifted from analogue and ground survey method to digital photogrammetric mapping method.

As a result, it is considered that the field survey parties (at present, more than 300 persons) will become overmanned anytime soon.

Furthermore, functional enhancement of photogrammetry section, GIS section and cartography section of SOB are necessary. In addition to the above, it is necessary to establish new sections responsible for data management, operation and maintenance of computers, software and server, technical development and training sections and so on.

The total staff number of SOB is decided by the regulation of the Government of Bangladesh, and it is impossible to increase staff number of SOB without amendment of the regulation concerning organization structure and personnel composition of SOB.

Therefore, downsizing of surplus manpower of the field survey parties is necessary, and reduced number of persons in the field survey parties will be allocated to other sections and also new sections.

Also, it is recommended that the capable staff in IDMS participating from the field survey parties will be officially transferred to photogrammetry and cartography sections of the present organization structure of SOB.

Through organization and personnel composition changes of SOB, it is necessary to show the transition of topographic mapping technology and roles of SOB clearly to the staff of SOB, especially to the low class staff and some of the middle class staff of SOB.

This is the first step for promotion of changes in the consciousness of the staff of SOB and also for the improvement of working attitude of the staff of SOB.

Next step is to eliminate the persons with no good working attitude. However, this is the most difficult issue in the government sector in Bangladesh.

It is strictly impossible to dismiss the persons, once he or she is employed in the government sector. Therefore, promotion and change of position of the staff of SOB by performance appraisal system are only available way for this issue.

10.5.5 Reorganization for new SOB suitable for digital era

As already described above, an organization structure and personnel composition of SOB are out of fashion from the view point of digital photogrammetric mapping and also digital era.

Therefore, the present organization structure and personnel composition of SOB have to be changed to an organization structure and personnel composition suitable to digital photogrammetric mapping and also digital era as soon as possible.

Frankly speaking, it is easy to change of organization structure and personnel composition in private sector in every country. However, in the government sector, this is a tough work, and it will take a long time even though it is available.

It is considered that organization structure and personnel composition of SOB have to be changed to new organization structure and personnel composition by the end of project period of IDMS.

As a matter of course, before the completion of IDMS, some staff of SOB will reach a mandatory retirement age and new staff may be recruited every year.

At the time of recruitment of new staff, it is necessary to select the persons who have high fundamental skill for computer and digital technology.

10.5.6 Reexamination of personnel composition of each section

After the completion of IDMS, SOB will possess 1:25,000 scale digital topographic data/maps covering whole territory of Bangladesh and 1:5,000 scale digital topographic data/maps covering five (5) major cities.

Secular change of digital topographic data/maps will be started at the time of completion of production of digital topographic data/maps, to be more accurate at the time of aerial photography. Therefore, periodical revision of digital topographic data/maps is necessary.

Meanwhile, future demands to SOB are considered as follows:

1) Large scale digital topographic data/maps of other cities
2) Establishment of geodetic control points (GPS points and BM) in urban area for urban redevelopment
3) Provision of more accurate DEM for national development plan, natural disaster mitigation plan and so on
4) Orthophoto and other related data

In addition, revision of the existing topographic data/maps including products of IDMS such as 1:25,000 and 1:5,000 scale digital topographic data/maps will become one of the main jobs of SOB after the completion of IDMS.

Therefore, during the implementation of IDMS, it is necessary to define the roles and jobs of SOB after the completion of IDMS.

Future organization structure and personnel composition of SOB will fully depend on the determination of future roles and jobs of SOB.

10.5.7 Generation change of staff of SOB

Frankly speaking, many elderly staff of SOB are unable to catch up with the technology advancement, especially advancement of computer and related software.

Due to the reason of advancement and popularization of computer and software relating survey and mapping, these knowledge and experience are absolutely essential capabilities not only for technical personnel, but also for office workers of SOB.

Unfortunately, many elderly staff of SOB have no knowledge and experience of computer and software such as Word, Excel and special software relating survey and mapping.

From the view point of age and capability of these elderly staff of SOB, it seems to be difficult to acquire a knowledge and experience of computer and software by the elderly staff of SOB in a short period of time.

Considering present situation of SOB mentioned above, main body of project implementation in SOB has to shift to young generation staff of SOB gradually.

10.5.8 Buildup of technical and management capability of middle class staff of SOB

In any organization, in any country, all matters will not be decided and managed by the top management of an organization.

Most of day to day administrative operations and operational management of project will be executed by the middle management (middle class staff) of the organization.

Important matters such as items having large discrepancy between plan and actual, issue having big impact to whole organization and so on will be informed from the middle management to the top management and the top management will make a final decision for these matters.

Concerning day to day administrative operations, a periodical report will be prepared by the middle management and submitted to the top management. The Top management of organization will grasp the situation of organization and ongoing project by the periodical report, and give instructions to the middle management if necessary.

In other word, main role of the top management is to make a decision or to show a direction of important matters of the organization.

Meanwhile, main role of the middle management is planning, day to day administrative and operational management of organization and project based on the decision and/or instruction made by the top management.

Main role of general office employee is to execute actual work under the instruction and control of the middle management.

Therefore, it is defined that day to day administrative operations and project operational management including reporting to the top management are the responsibility of the middle management.

However, it is considered that many middle class staff of SOB has only a superficial understanding of this matter.

Many meetings with the middle class staff of SOB have been held during the implementation of BDMAP. However, it was found that only few middle class staff of SOB understands the above-mentioned matter clearly.

At any time, many persons say as “This will be decided by Director” or “This will be decided

by Surveyor General".

From the view point of organization theory, it is correct that the top management has a power to make a final decision and also has a responsibility for the final decision. However, it is necessary to consider who will prepare the information and materials necessary for the final decision by the top management.

Also, it is necessary to discriminate items to be judged by the top management directly and items to receive approval from the top management depend of importance level.

In case of direct judgment by the top management, role of the middle management is to prepare the information and materials necessary for the judgment by the top management, and the middle management will not make any judgment.

However, in case of approval from the top management, the middle management has to make some judgment or plan before the approval by the top management. An approval or rejection by the top management will depend on validity, logicality, efficiency and so on of judgment or plan made by the middle management.

Many middle management of SOB do not understand the difference between direct judgment and approval.

At a same time, the middle management has to understand that periodical report to the top management is one of the most important roles of the middle management.

10.5.9 Strengthening of staff management

The capability of the staff of SOB may be able to build up by lecture or training to a certain level. However, without a conscious mind of self-learning of the staff of SOB, the effect of lecture and training is limited. Therefore, the staff of SOB should have a mind to study by themselves.

Lack of social imperative of the low class staff of SOB, especially being less than punctual and no sense of responsibility, may be the typical issue of the government sector in Bangladesh. These issues may not be solved by lecture and training of technical aspects.

These are the issues of labor management of the government sector in Bangladesh, and it will take a long time to solve these issues or improve the present situation.

At present, it is considered that staff management, especially labor management to the low

class staff of SOB, is not working effectively. Therefore, more effective labor management system of SOB has to be established.

The main reasons of low productivity and efficiency of SOB (maybe, all government sectors in Bangladesh) are lack of social imperative of the low class staff, ineffective labor management and low management capability of some middle class staff of SOB.

10.6 Difference between the ideal and the real

Unfortunately, both technical capability and planning/management capability of person and organization will not be improved suddenly and drastically. These capabilities will be improved little by little, taking a long time, through the engagement of actual works.

It is considered that many persons of the government sector in developing countries embrace the illusion that technical capability of person and/or organization can be improved drastically and immediately by introducing new equipment and/or software, or technical training for new technology.

The equipment and software are mere tools. These are "necessary condition" and not "necessary sufficient condition".

If the persons of organization can not utilize the equipment and software in an effective and efficient manner, it is a wasteful expenditure.

Also, in case the person who has no experience of actual works participates in technical training for new technology, it is not sure that such person can execute the actual works or manage the project.

It is considered that main issue of some middle class staff of SOB is lack of experience of actual works.

Due to the lack of experience of actual work, such persons have only a desk theory and can not take the realistic and concrete approaches to the work and project.

Also, an issue exists in project planning and management aspects. This is the issue of "difference between the ideal and the reality" in SOB.

It is necessary to grasp a technical capability, planning capability, management capability and work attitude of all staff of SOB accurately.

Based on the results, available jobs, accuracy, productivity and so on of each staff of SOB will be evaluated, and change of work contents or position of some staff of SOB must be considered, if necessary.

It is easily imagine that the ideal without a sense of reality will be deadlocked at some future day.

In case an aggressive target is set as a final target, it is necessary to reach final target through several stages.

Therefore, it is necessary to make clear the issues to be solved on a short term basis, middle term basis and long term basis, and to make an effort to achieve a target(s) by the members of organization step by step.

Chapter 11 Recommendations to SOB

Chapter 11 Recommendations to SOB

The recommendations to SOB for the smooth implementation of IDMS are as follows:

11.1 What is the index for completion (success) of IDMS?

The overall goal of BDMAP mentioned on original PDM (Version 0.1, 24 November 2008) is "SOB implements the project of Digital Mapping System of Survey of Bangladesh (IDMS Project)".

It is considered that this sentence does not simply mean the completion of actual works such as 1:5,000 and 1:25,000 scale digital topographic data/maps and so on of IDMS.

The sentence of "IDMS will be completed" should be interpreted as "IDMS will be completed successfully". In that case, it is necessary to define the indexes for judgment of success of IDMS as already explained on the lecture of project management which was executed in the 2nd year of BDMAP.

From the view points of project management, the indexes to be used for the judgment of success or failure of a project are generally as follows:

1) A project completed within the planned schedule or not.

2) A project completed within the planned budget or not.

3) Outputs of a project had an enough accuracy and quality or not.

4) Technique and know-how were accumulated in an organization or not.

5) Satisfaction level of stakeholder was high or low.

6) Fatal accident occurred or not.

As a matter of course, background of a project is different project by project. Therefore, the indexes mentioned above can not be applied in the same level for the project evaluation.

For example, some project has to complete the work strictly within a work period, but, there is a lot of flexibility of budget.

In this case, the project, which is not completed within the decided work schedule, will be judged as a failure, even though other indexes are perfectly achieved.

In general, the project without a satisfaction of stakeholders will be judged as a failure, even though other indexes are success.

It is considered that above six (6) indexes are enough for the evaluation of success or failure of IDMS. However, it is necessary to add a weight factor to each index before the evaluation.

Concerning above items of 1) and 2), it is necessary to consider the circumstances of the period when IDMS was planned and proposed to the Government of Bangladesh, and also the circumstances after starting the actual works of IDMS.

1) Does IDMS complete within the estimated work period or not?

According to the original work schedule of IDMS, procurement of digital photogrammetric mapping equipment and software was planned to be completed by December 2009, and technical training to the staff of SOB was planned to be executed using these equipment and software form December 2009 in a concentrated manner.

Also, the contract of aerial photography between SOB and aerial photography company was planned to be concluded by the end of October 2009, and actual work of aerial photography was planned to be started from around December 2009.

Therefore, according to the original plan of IDMS and BDMAP, it was estimated that actual digital photogrammetric mapping works (office works) were able to start from around April 2010.

However, by the decision as re-tender for the procurement of digital photogrammetric mapping equipment and aerial photography by the Government of Bangladesh, the work schedules of IDMS and BDMAP were delayed from the original work schedule of IDMS and BDMAP form the beginning stage. Therefore, the works schedule and implementation plan of IDMS and BDMAP were drastically changed at the beginning of IDMS and BDMAP.

Finally, the date of delivery and setting up of digital photogrammetric equipment and software by the contractor was around June 2011, and the date of completion of aerial photography by the contractor was also around June 2011.

Therefore, the starting date of actual works of digital photogrammetric mapping (office works) was delayed approximately 14 months from the original plan.

Project period of IDMS is from 2007 up to 2016. However, due to the delay of the starting date of actual work as approximately 14 months, it is judged that IDMS can not be completed by 2016, even though the actual works of IDMS are implemented according to the original work schedule plan.

2) Does IDMS complete within the planned budget or not?

IDMS was planned and proposed to the Government of Bangladesh on 2004, and necessary cost for the implementation of IDMS was also calculated on 2004. At that time, IDMS was estimated to be started from 2005.

However, actually, the stating date of IDMS was 2007 and approximately 4 years has been passed after project of IDMS was planned and proposed to the Government of Bangladesh.

The estimated cost of IDMS was calculated on 2004 by the currency of Bangladesh Taka. Due to the delay of project starting, following two (2) issues were occurred.

a) An increase of manpower cost during the period from 2004 to present was not counted.

b) A fluctuation of exchange rate between Taka and US$ during the period from 2004 to present was not counted. The approximate exchange rate between Taka and US$ are as follows:

Exchange rate at project planning (around March 2004)
Approx. US$1 = Tk60.00

Exchange rate at the 1st year of BDMAP (around June 2009)
Approx. US$1 = Tk70.13

Exchange rate at the 2nd year of BDMAP (around June 2010)
Approx. US$1 = Tk68.34

Exchange rate at the 3rd year of BDMAP (around June 2011)
Approx. US$1 = Tk72.00

Exchange rate at the 4th year of BDMAP (around June 2013)
Approx. US$1 = Tk80.00

Therefore, the value of Taka at the time of implementation of IDMS decreased approximately 15～20 % from the time of project planning.

The procurement of digital photogrammetric mapping equipment and software, and aerial photography were executed based on the contract between SOB and foreign companies.

Therefore, the decrease of value of Taka means the increase of procurement cost for digital photogrammetric mapping equipment and software, and aerial photography (approx. 15～20 % up, not including price boost) of IDMS.

Considering the above-mentioned factors, it is judged that IDMS will not be completed within the amount of the original budget.

Also, it is estimated that IDMS will not be completed according to the work schedule plan which was made on 2004 due to the delay of the starting date of actual works of IDMS.

Therefore, the Government of Bangladesh is necessary to amend the project plan of IDMS from the view points of budget and work period.

11.2 Improvement of planning capability

Proper project planning is essential for the implementation of the project.

It is necessary to prepare several kinds of plans for the implementation of the project such as total project plan, detail plan of each works consisting of the project, assignment plan and so on.

To make such plans, it is necessary to set up figures such as volume of each works, work schedule, number of equipment to be used, number of personnel to be engaged, productivities of each works and so on.

In case these plans are not realistic, it is impossible to implement the project smoothly.

In case the plan has too much allowance in budget, schedule, numbers of personnel and so on, stakeholder will consider that the validity and productivity of the project are low.

Therefore, setting up of proper productivities of each work of the project is the most important key factor for a realistic project plan, and also for project explanation to stakeholders.

It is said that productivities which will be proposed by the staff of production department is always low before starting the project. In general, it is said that productivities which will be proposed by the staff of production department is approximately 1/2 of maximum value of

productivities of the production department.

In case the works which are not yet executed by the production department, productivities to be proposed by the production department will show a tendency of low productivities.

In that case, only negative aspects of the project will stand out, and there is a high probability that the project will not be approved or canceled.

Therefore, improvement of planning capability of the staff of SOB is important key factors for planning and implementation of future projects of SOB.

11.3 Improvement of progress management capability

A proper progress management is essential for the implementation of the project according to schedule, especially huge project such as IDMS.

The progress management does not simply mean the monitoring of progress of work.

In case of the delay of work or high frequency of errors, it is necessary to analyze the source of issues or cause of the delay, and also to take necessary countermeasures not to occur the delay or same issues again and again.

That is to say, progress management means the process of “Check ⇒ Analysis ⇒ Action” of project cycle of “Plan ⇒ Do ⇒ Check ⇒ Analysis ⇒ Action” that is the basis of project management.

Through the implementation of actual works of IDMS, the staff of SOB has already understood the importance of this project cycle and executed steps of “Plan ⇒ Do ⇒ Check”.

However, it is considered that the persons who clearly understand the importance of steps of “Analysis ⇒ Action”, and also “to take proper countermeasures to avoid the delay or same issues” are very limited.

To analyze the source of issues or delay, and to consider the method(s) to improve the situation, wide knowledge and huge experience of actual works are necessary.

IDMS is the first digital photogrammetric mapping project in SOB. Therefore, the persons who can execute progress management of digital photogrammetric mapping project properly in SOB are very limited.

In other word, many staff of SOB has no idea to improve the methodology and efficiency of the works, and just do the work according to the passed experiences and conventional methods.

11.4 Improvement of productivity

In general, following methods will be applied to shorten the work schedule of digital photogrammetric mapping project.

1) Increase of manpower and equipment

2) Build up of technical skill of operators and improvement of productivity

3) Simplification of work method

4) Reduction of volume of errors and mistakes, and volume of re-works

5) Reduction of needless working hours by proper project planning and management

6) Utilization of idle equipment

7) Reduction of time loss caused by equipment trouble

8) Increase of work hours per one (1) day or work day per one (1) month

9) Outsourcing of part of works of the project

The most important methods for the implementation of IDMS according to the schedule are 2) Build up of technical skill of operators and improvement of productivity, 3) Simplification of work method, 4) Reduction of volume of errors and mistakes, and volume of re-works, 5) Reduction of needless working hours by proper project planning and management, and 6) Utilization of idle equipment.

For above five (5) methods, it is not necessary to allocate extraordinary budget. These five (5) methods can be applied by the improvement of technical skill, and planning and management capabilities.

Concerning method of 6) Utilization of idle equipment, it is necessary to check the real net working rate of all equipment of IDMS by SOB.

1) Check of net working rate of equipment
   In case of the following situation, it is necessary to utilize the idle equipment in an efficient manner.

   - Equipment not working due to unsuitable relation between number of equipment and work volume
   - Equipment using by operators having long leave
   - Equipment using by operators engaging in field works or other works

2) In IDMS, 1:25,000 scale digital plotting along the international boundary area, except spot heights and contour lines, will be executed by 2D data acquisition method using satellite images. Therefore, it is not necessary to use digital plotting system for data acquisition except spot heights and contour lines drawing.

   To reduce the work period of 1:25,000 scale digital plotting, it is necessary to consider the utilization of other equipment and software instead of digital plotting system for 2D data acquisition along international boundary area.

For other method, it is necessary to allocate an additional budget.

11.5 Improvement of staff management of SOB

It is considered that staff management for low class staff of SOB does not put into effect. This is applied to some middle class staff of SOB.

Some low class staff of SOB is always chattering, long talking by mobile phone, long time absence during office hours and so on.

However, many middle class staff of SOB does not give a warning against such persons.

It is not sure that this is a typical overall issue of the government sector in Bangladesh or a special issue of SOB.

However, such issue is an evidence of not a first class organization in the government sector of Bangladesh, and it is necessary to breakaway from such a situation and to enter into the first class organization in the government sector of Bangladesh.

11.6 Development of human resources with wide knowledge and experience

Production of 1:25,000 and 1:5,000 scale digital topographic data/maps of IMDS has been started from the beginning of the 3rd year of BDMAP (around June 2011). By the end of the 4th year of BDMAP (September 2013), more than 2 years has been already passed.

During this period, SOB produced 1:25,000 and 1:5,000 scale digital topographic data/maps by solving various kinds of issues and troubles.

Therefore, it is judged that staff of each section of IDMS mastered various technique and know-how concerning digital photogrammetric mapping through the implementation of actual work of IDMS.

However, it is impossible to implement digital photogrammetric mapping project smoothly and effectively only by recruiting persons who has a knowledge and experience of actual work of digital photogrammetric mapping such as aerial triangulation, digital plotting, GIS basic data production and digital cartography.

Because, project manager, who has a wide knowledge and experience of digital photogrammetric mapping and also has a leadership, is essential for the smooth and effective implementation of the project.

The digital topographic data/maps are output of the chain of works such as aerial photography, GCP survey, aerial triangulation, digital plotting, GIS basic data production and digital cartography works.

The important point of this chain of works is that all works are interrelated, and the output of former stage of work is the input of next stage of work.

Therefore, persons in charge of sections need a knowledge and experience of not only own section, but also former and after sections.

As a matter of course, project manager of digital photogrammetric mapping project needs a general knowledge of digital photogrammetric mapping works.

If not, it is difficult to make a plan of digital photogrammetric mapping project and also to manage the digital photogrammetric mapping project.

From this point of view, the present situation of SOB is considered as follows:

1) The person in charge of section or unit in IDMS has already grasped the contents of works of own section or unit. However, a knowledge and experience of former and after steps of work are limited.

2) Some middle class staff of SOB has knowledge and experience of several steps of digital photogrammetric mapping works. However, there is no person who has an overall knowledge of digital photogrammetric mapping.

To make a plan of new digital photogrammetric mapping project or a plan for revision survey of the existing topographic maps, and implementation of such project by SOB itself, it is necessary to bring up persons who have a wide knowledge and experience of actual works of digital photogrammetric mapping.

For this purpose, it is necessary to take the following actions.

1) Periodical change in personnel among sections of IDMS

2) Participation for seminar or training concerning organization theory, project management and labor management

3) When the person is assigned to a position of manager, it is necessary to select the suitable persons not only based on an academic background, but also a management capability of project and organization. There are many persons who have a high academic background, but no management capability of project and organization in the world around us.

11.7 Switch in personnel among sections of SOB

It is considered that the staff of SOB, especially the middle class staff of SOB, has the following characteristics on the technical aspects.

1) Limited technical knowledge and experience

2) Lack of peripheral knowledge and technology of survey and mapping

3) To express an opinion same as the theory described on the textbook

4) Impractical opinion from the view point of budget, schedule, manpower, accuracy and so on

5) Hesitate to change the plan once plan is decided

It is estimated that these characteristic of the staff of SOB derives from the under-mentioned factors.

1) No chance to be able to engage in other works

2) Lack of awareness that present digital photogrammetric mapping consists of wide technical field such as mathematics, statistics, theory of error, geomorphology, cartography, computer technology and so on

3) Limited experience of actual works

4) Lack of experience of project planning and management

Periodical personnel reshuffle between the different sections is recommended to improve the above situation of SOB. By personnel reshuffle, the middle class staff of SOB can obtain a wide knowledge and experience which are necessary for project planner and project manager.

11.8 Organization restructuring of SOB

The present organization of SOB was made on the premise of analogue topographic mapping technology and revision survey by ground survey method, not digital photogrammetric mapping technology and revision survey by digital photogrammetric mapping method.

Therefore, more than 300 persons (not including persons belonging to geodetic section) belong to “Field Survey Party” of SOB.

However, SOB already decided to shift topographic mapping and revision survey from analogue and ground survey method to digital photogrammetric mapping method by the implementation of IDMS.

This decision means that total work volume of “Field Survey Party” in SOB will be decreased from now on.

At the same time, it is necessary to maintain equipment and software of digital photogrammetric mapping, to develop new technologies concerning survey and mapping, and also to introduce new equipment and software with an advancement of technology of survey and mapping.

IDMS is a project team for 1:25,000 and 1:5,000 scale digital photogrammetric mapping project which is organized in SOB.

From a view point of organizational theory, “project team” is defined as a temporary organization, which is organized in the existing organization, to implement the specific purpose.

Member of IDMS were selected from the existing sections of SOB for the implementation of IDMS, and basically, members of high position and section in charge of IDMS is “Additional post type” and the staff of sections in IDMS is “”Full time type”.

Accordingly, at the time of completion of IDMS, the organization of IDMS will be automatically dissolved and the members of IDMS will return to their original sections.

Therefore, it is necessary to take measures for re-organization of SOB before the completion of IDMS. If not, SOB will be still outdated organization forever (an organization and distribution of personnel for analogue and ground survey mapping method).

It is considered that re-organization of structure and re-distribution of personnel of SOB suitable for new digital era is essential for SOB.

11.9 Growing of private sector and possibility of outsourcing of work

The relation between the national survey and mapping organization, and survey and mapping private sector may be as flows from a historical point of view.

1) Approximately before the 20th century

It is considered that no survey and mapping private sector existed in all over the world.

The main demand of topographic maps in this period was a military purpose and colonial management and development, and it is considered that there was no demand of private sector.

Therefore, it is estimated that all of topographic maps were prepared by the national survey and mapping agency or military.

2) From the beginning to middle of the 20th century

The period from the beginning of the 20th century to the 1950’s was an age of imperialism, and World War I and II were occurred in this period.

As a matter of course, it is considered that topographic maps were prepared mainly for a military purpose and produced by the national survey and mapping organization or military.

After World War II, topographic maps were prepared by photogrammetric mapping method not only by the national survey and mapping organization, but also by private sector in the advanced countries.

Therefore, during this period, main works of private survey companies in the advanced countries are considered as large scale topographic mapping by ground survey method or survey for construction project and so on.

3) After the 1950s

After the 1950s, European countries recovered from the damages of World War II and entered into a high-growth period. During this period, many colonies moved toward independence.

Private survey and mapping companies, that main job is topographic mapping by photogrammetric mapping methods, were established in the advanced countries due to a rapid economic development.

In Japan, the first private photogrammetric survey and mapping company (Asia Air Survey Co., Ltd.) was established in 1949.

Due to the increase in the demand of survey and mapping by economic development, some works of the national survey and mapping organization was executed by outsourcing to the private sector in the advanced countries.

Meanwhile, the demand of survey and mapping in the developing countries was still small and private survey and mapping companies were not yet established in the developing countries.

Therefore, it is considered that survey and mapping in the developing countries was executed by the national survey and mapping organization during this period.

4) Present

At present, main jobs of the national survey and mapping organization in the advanced countries are planning, research and data management of geospatial data and information and so on. Many works such as data acquisition and so on were executed by outsourcing.

Meanwhile, due to the increase of the demand of survey and mapping in the developing countries, private photogrammetric survey companies were established in the developing countries.

Some national survey and mapping organization in the developing countries are shifting from an implementation organization of survey and mapping to a planning and management organization of survey and mapping gradually.

In Bangladesh, due to the recent economic development, the demands of geospatial data increase year by year.

Therefore, it is estimated that the work volume of SOB will be increased year by year.

Considering the above-mentioned situation, it is recommended that following should be considered by SOB.

1) Work volume of SOB will increase or not. What kind of work will increase? What kind of work will decrease?

2) In case of increase of work volume, is it possible to execute the works by the present work capacity of SOB or not?

3) What kinds of jobs have to be executed directly by SOB?

4) What kinds of jobs can be executed by outsourcing?

5) Present capability and capacity of private survey and mapping companies in Bangladesh

6) It is necessary to evaluate the economic efficiency of both above-mentioned methods, and to judge which method is better from the view point of economic efficiency.

At all events, in case the demand of geospatial data and information increases in near future, it is estimated that SOB can not keep up with the demand by the present capacity and capability of production of SOB.

Therefore, it is necessary to consider a policy and countermeasures concerning this issue from now.

Appendix

Appendix 3.1 PDM of BDMAP (Version 0.1, 24 November 2008)

Project Design Matrix of BDMAP

Cooperation Period : July 2009 - 2011,(3years)
Implementation Agency : Survey of Bangladesh (SOB)
Target Group: SOB
Working Area : Dhaka
Made on Nov 24th, 2008, Ver. 0.1

Narratives Summary	Indicators	Means of Verification	Important Assumptions
Overall Goal			
SOB implements the project of "Improvement of Digital Mapping System of Survey of Bangladesh" (IDMS project)	1. SOB will provides 1:25000 and 1:5000 scale topographic map and database to government and private users.	- Project report of IDMS project	- Necessary budget to produce digital map and database will be continuously allocated to SOB.
Project Purpose			
Technical staffs of SOB will develop their skills enough to implement the digital mapping in the scale of 1/5,000 and 1/25,000.	1. 70% of SOB technical staffs have a right understanding of Specification and can work following the instruction of it.	- Project Report - Minutes of the Monthly Technical Coordinaiton Meeting	- The other technical areas which are not subjects of JICA technology transfer project also have enough ability to conduct the IDMS project.
Outputs			
1. SOB has the Specification of the process of digital mapping.	1-1. Specification of process and product of the digtal mapping is determined. 1-2. Specification of process and product digital map is introduced to all relative departments of SOB.	- Copy of the Specification - Project report	- Trained staffs of SOB are retained in their department during the project implementation.
2. SOB technical staffs understand about methodology to correct geoid model.	2-1. Program and manual of geoid model correction is made. 2-2. Program and manual of geiod model correction is introduced to relative departments.	- Program and manual of Geoid model correction.	
3. Technical staffs of SOB acquire essential technology of aerial triangulation.	3-1. Operation manual of aerial triangulation is made. 3-2. Plan of training of aerial triangulation is made. 3-3. Training of aerial triangulation is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 3-4. OJT of Arial triangulation is conducted to at least 70% of SOB technical staffs in the respective field.	- Project report - Training report - Training materials - Operation manual	
4. Technical staffs of SOB acquire essential technology of ortho photo making.	4-1. Operation manual of ortho photo making is made. 4-2. Training plan of ortho photo making is made. 4-3. Training of ortho photo making is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 4-4. OJT of ortho photo making is conducted to at least 70% of SOB technical staffs in the respective	- Project report - Training report - Training materials - Operation manual	
5. Technical staffs of SOB acquire essential technology of DEM making.	5-1. Operation manual of DEM making is made. 5-2. Training plan of DEM making is made. 5-3. Training of DEM making is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 5-4. OJT of DEM making is conducted to at least 70% of SOB technical staffs in the respective field.	- Project report - Training report - Training materials - Operation manual	
6. Technical staffs of SOB acquire essential technology of digital plotting.	6-1. Operation manual of Digital Plotting is made. 6-2. Training plan of Digital Plotting is made. 6-3. Training of Digital Plotting is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 6-4. OJT of Digital Plotting is conducted to at least 70% of SOB technical staffs in the respective field.	- Project report - Training report - Training materials - Operation manual	
7. Technical staffs of SOB acquire essential technology of digital compilation	7-1. Operation manual of digital compilation is made. 7-2. Training plan of digital compilation is made. 7-3. Training of digital compilation is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 7-4. OJT of digital compilation is conducted to at least 70% of SOB technical staffs in the respective	- Project report - Training report - Training materials - Operation manual	
8. Technical staffs of SOB acquire essential technology about construction and management of GIS database.	8-1-1. Operation manual of construction and management GIS databese is made. 8-1-2. Training plan of construction and management GIS databese is made. 8-1-3. Training of construction and management GIS databese is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 8-1-4. OJT of construction and management GIS databese is conducted to at least 70% of SOB technical staffs in the respective field .	- Project report - Training report - Training materials - Operation manual	
9-1. Technical staffs of SOB improve their skills in printing map.	9-1-1. Operation manual of printing map is made. 9-1-2. Training plan of printing map is made. 9-1-3. Training of printing map is conducted and at least 70% of SOB technical staffs in the respective field understand about the operation manual. 9-1-4. OJT of printing is conducted to at least 70% of SOB technical staffs in the respective field .	- Project report - Training report - Training materials - Operation manual	
9-2. Printing equipment of SOB is operational with a good condition.	9-2-1. Maintenance plan is determined 9-2-2. All units of printing equipments which the IDMS project requires are well maintained.	- Maintenance plan - Maintenance record	
Activities	***Input***		
	Bangladeshi Side	Japanese Side	
1-1. To provide supervision and technical support to activities of the JICA technical transfer project. 1-2. To make Specification for Digital Mapping 2. To make program and manual of geoid model correction 3-1. To conduct training about Aerial triangulation technique 3-2. To conduct OJT about Aerial triangulation technique 3-3. To make operation manual about Aerial triangulation 4-1. To conduct training about ortho photo making technique 4-2. To conduct OJT about ortho photo making technique 4-3. To make operation manual about ortho photo making 5-1. To conduct training about DEM making technique 5-2. To conduct OJT about DEM making technique. 5-3. To make operation manual about DEM making 6-1. To conduct training about digital plotting technique 6-2. To conduct OJT about digital plotting technique 6-3. To make operation manual about digital plotting 7-1. To conduct training about digital compilation technique 7-2. To conduct OJT about digital compilation technique 7-3. To make operation manual about digital compilation technique 8-1. To conduct training about GIS map data making technique 8-2. To conduct OJT about GIS map data making technique. 8-3. To make operation manual about GIS map data making 9-1. To conduct training about printing technique 9-2. To conduct OJT about printing technique. 9-3. To make operation manual about printing technique. 9-4. To make maintenance plan of printing machine.	1. Assignment of counterparts personnel - Project manager - Aerial triangulation - Ortho image - DEM - Digital plotting - Digital compilation - GIS map data - Printing - Geoid model correction 2. Facilities - Office room for Japanese experts - Telephone line and internet connection	1. Assignment of Japanese experts; - Team Leader - Specifications - Aerial triangulation - Ortho photo - DEM - Digital plotting - Digital compilation - GIS database - Printing - Geoid model correction 2. Training - Mapping management - Map utilization	- Procurement of necessary equipment is done according to schedule by SOB. - Aerial photo is taken according to schedule by SOB. - Adequate number of technical staffs of SOB will be assigned. ***Precondition***

Appendix 3.2 PDM of BDMAP (Version 2.0, 6 August 2009)

Project Design Matrix of BDMAP

Cooperation Period: July 2009 - 2011 (3 years)
Target Group: SOB
Implementation Agency: Survey of Bangladesh (SOB)
Working Area: Dhaka
Made on Aug. 6th, 2009, Ver. 2.0

Narratives Summary	Indicators	Means of Verification	Important Assumptions
Overall Goal			
1. SOB implements the project of "Improvement of Digital Mapping System of Survey of Bangladesh" (IDMS project).	1. SOB will provides 1:25,000 and 1:5,000 scale topographic maps and database to government and private users.	- Project report - Delivery record of topographic maps and data	- Necessary budget to produce digital map and database will be continuously allocated to SOB.
Project Purpose			
1. Technical staff of SOB will develop their skills enough to implement the digital mapping in the scale of 1:5,000 and 1:25,000, and actual work of IDMS Project is implemented correctly and smoothly.	1-1 70% of SOB technical staff have a right understanding of Specifications and can work following the instruction of it. 1-2 The actual mapping works of IDMS Project will be implemented on schedule based on the Operation Manual and Specifications	- Project report - Actual work progress of IDMS Project - Questionnaire survey	- The other technical areas which are not subjects of JICA technical transfer project also have enough ability to conduct the IDMS project.
Outputs			
1. SOB has the specifications of the process and products of digital mapping	1-1 Specifications of process and product of the digital mapping is determined. 1-2 Specifications of process and product digital map is introduced to all relative department of SOB	- Copy of the Specifications - Project report - Questionnaire survey	- Trained staff of SOB are retained in their department during the project implementation.
2 Technical staff of SOB understand the theory of photogrammetry and aerial triangulation.	2-1 Training of photogrammetry is conducted and at least 70 % of participants to the training understand the theory of photogrammetry. 2-2 Training of aerial triangulation is conducted and at least 70% of the participants to the training understand the theory of aerial triangulation.	- Project report - Training materials - Training record - Questionnaire survey	
3 Technical staffs of SOB acquire essential technology of aerial triangulation.	3-1 Operation manual of aerial triangulation is made. 3-2 Plan of training of aerial triangulation is made. 3-3 Training of aerial triangulation is conducted and at least 70% of the participants of the training understand about the operational manual. 3-4 OJT of aerial triangulation is conducted to at least 70% of SOB technical staffs in the respective field.	- Project report - Operational manual - Training plan - Training record - Practical examination - Paper examination - Questionnaire survey	
4. Technical staffs of SOB acquire essential technology of orthophoto making.	4-1 Operation manual of orthophoto making is made. 4-2 Plan of training of orthophoto making is made. 4-3 Training of orthophoto making is conducted and at least 70% of the participants of the training understand about the operation manual. 4-4 OJT of orthophoto making is conducted to at least 70% of SOB technical staffs in the respective field.		
5. Technical staffs of SOB acquire essential technology of DEM making.	5-1 Operation manual of DEM making is made. 5-2 Training plan of DEM making is made. 5-3 Training of DEM making is conducted and at least 70% of the participants of the training understand about the operation manual. 5-4 OJT of DEM making is conducted to at least 70% of SOB technical staffs in the respective field.		
6. Technical staffs of SOB acquire essential technology of digital plotting.	6-1 Operation manual of digital plotting is made. 6-2 Training plan of digital plotting is made. 6-3 Training of digital plotting is conducted and at least 70% of the participants of the training understand about the operation manual. 6-4 OJT of digital plotting is conducted to at least 70% of SOB technical staffs in the respective field.		
7. Technical staffs of SOB acquire essential technology of digital compilation.	7-1 Operation manual of digital compilation is made. 7-2 Training plan of digital compilation is made. 7-3 Training of digital compilation is conducted and at least 70% of the participants of the training understand about the operation manual. 7-4 OJT of digital compilation is conducted to at least 70% of SOB technical staffs in the respective field.		
8. Technical staffs of SOB acquire essential technology about construction and management of GIS database.	8-1 Operation manual of construction and management of GIS database is made. 8-2 Training plan of construction and management of GIS database is made. 8-3 Training of construction and management of GIS database is conducted and at least 70% of the participants of the training understand about the operation manual. 8-4 OJT of construction and management of GIS database is conducted to at least 70% of SOB technical staffs in the respective field.		
9-1 Technical staffs of SOB improve their skills in printing map.	9-1-1 Operation manual of printing map is made. 9-1-2 Training plan of printing map is made. 9-1-3 Training of printing map is conducted and at least 70% of the participants of the training understand about the operation manual. 9-1-4 OJT of printing is conducted to at least 70% of technical staffs in the respective field.		
9-2 Printing equipment of SOB is operational with a good condition	9-2-1 Maintenance plan is determined. 9-2-2 All units of printing equipments which the IDMS project requires are well maintained.	- Maintenance plan - Maintenance record	
10. Technical staffs of SOB acquire essential technology about geoid model creation.	10-1 Operation manual of geoid model is made. 10-2 Geoid model is made. 10-3 Training of geoid model creation is conducted and at least of 70% of the participants of the training understand about the operation manual 10-4 OJT of geoid model creation is conducted to at least 70% of SOB technical staffs in the respective field.	- Operational manual - Created Geoid model - Training record - Questionnaire survey	

Activities	Input		
	Bangladesh Side	**Japanese Side**	
1-1 To make Specifications for digital mapping 1-2 To translate Specifications into Bengalee 1-3 To provide overall technical support to IDMS project 1-4 To provide overall management support to IDMS project 2-1 To conduct lecture of photogrammetry theory 2-2 To conduct lecture of aerial triangulation theory 3-1 To make a training plan of aerial triangulation technique 3-2 To conduct technical training of aerial triangulation technique 3-3 To conduct training of quality and schedule control 3-4 To make Operation Manual of aerial triangulation 3-5 To translate Operation Manual into Bengalee 4-1 To make a training plan for orthophoto making technique 4-2 To conduct technical training of orthophoto making technique 4-3 To conduct training of quality and schedule control 4-4 To make Operation Manual about orthophoto making technique 4-5 To translate Operation Manual into Bengalee 5-1 To make a training plan of DEM making technique 5-2 To conduct technical training of DEM making technique 5-3 To conduct training of quality and schedule control 5-4 To make Operation Manual of DEM making technique 5-5 To translate Operation Manual into Bengalee 6-1 To make a training plan of digital plotting technique 6-2 To conduct technical training of digital plotting technique 6-3 To conduct training of quality and schedule control 6-4 To make Operation Manual of digital plotting technique 6-5 To translate Operation Manual into Bengalee 7-1 To make a training plan of digital compilation technique 7-2 To conduct technical training of digital compilation technique 7-3 To conduct training of quality and schedule control 7-4 To make Operation Manual of digital compilation technique 7-5 To translate Operation Manual into Bengalee 8-1 To make a training plan of construction and management of GIS database 8-2 To conduct technical training of construction and management of GIS database 8-3 To conduct training of quality and schedule control 8-4 To make Operation Manual of construction and management of GIS database 8-5 To translate Operation Manual into Bengalee 9-1 To make Maintenance Plan of of printing machine 9-2 To make a training plan of printing technique 9-3 To conduct technical training of printing technique 9-4 To conduct training of quality and schedule control 9-5 To make Operation Manual of printing technique 9-6 To translate Operation Manual into Bengalee 10-1 To make a training plan of geoid model creation technique 10-2 To conduct technical training of geoid model creation technique 10-3 To create geoid model 10-4 To make Operation manual of geoid model creation 10-5 To translate Operation Manual into Bengalee	**1. Assignment of counterparts personnel** - Project manager - Aerial triangulation - Ortho image - DEM - Digital plotting - Digital compilation - GIS map data - Printing - Geoid model **2. Facilities** - Office room for Japanese experts - Telephone line and internet connection	**1. Assignment of Japanese experts** - Project leader - Chief / Technical specifications - Photogrammetry / Aerial triangulation Theory - Aerial triangulation, Orthophoto making and DEM making (1) - Aerial triangulation, Orthophoto making and DEM making (2) - Digital mapping - Digital compilation - GIS database - Printing - Geoid model **2. Training in Japan** - Topographic maps and data management - Topographic maps and data utilization	- Procurement of necessary equipment is done according to the schedule by SOB. - Aerial photo is taken according to the schedule by SOB. - Adequate number of technical staff of SOB will be assigned. **Precondition**

Appendix 3.3 PDM of BDMAP (Version 3.0, 23 November 2011)

Project Design Matrix of BDMAP

Cooperation Period: July 2009 - March 2011
Target Group: SOB

Implementation Agency: Survey of Bangladesh (SOB
Working Area: Dhaka

Made on Dec. 6th, 2011, Ver 3.0

Narratives Summary	Indicators	Means of Verification	Important Assumptions
Overall Goal 1. SOB implements the project of "Improvement of Digital Mapping System of Survey of Bangladesh" (IDMS project).	1. SOB will provides 1:25,000 and 1:5,000 scale topographic maps and database to government and private users.	- Project report - Delivery record of topographic maps and data	- Necessary budget to produce digital map and database will be continuously allocated to SOB.
Project Purpose 1. Technical staff of SOB will develop their skills enough to implement the digital mapping in the scale of 1:5,000 and 1:25,000, and actual work of IDMS Project is implemented correctly and smoothly.	1-1 70% of SOB technical staff have a right understanding of Specifications and can work following the instruction of it. 1-2 The actual mapping works of IDMS Project will be implemented on schedule based on the Operation Manual and Specifications	- Project report - Actual work progress of IDMS Project - Questionnaire survey	- The other technical areas which are not subjects of JICA technical transfer project also have enough ability to conduct the IDMS project.
Outputs 1. SOB has the specifications of the process and products of digital mapping	1-1 Specifications of process and product of the digital mapping is determined. 1-2 Specifications of process and product digital map is introduced to all relative department of SOB	- Copy of the Specifications - Project report - Questionnaire survey	- Trained staff of SOB are retained in their department during the project implementation.
2 Technical staff of SOB understand the theory of photogrammetry and aerial triangulation.	2-1 Training of photogrammetry is conducted and at least 70 % of participants to the training understand the theory of photogrammetry. 2-2 Training of aerial triangulation is conducted and at least 70% of the participants to the training understand the theory of aerial triangulation.	- Project report - Training materials - Training record - Questionnaire survey	
3 Technical staffs of SOB acquire essential technology of aerial triangulation.	3-1 Operation manual of aerial triangulation is made. 3-2 Plan of training of aerial triangulation is made. 3-3 Training of aerial triangulation is conducted and at least 70% of the participants of the training understand about the operational manual. 3-4 OJT of aerial triangulation is conducted to at least 70% of SOB technical staffs in the respective field.	- Project report - Operational manual - Training plan - Training record - Practical examination - Paper examination - Questionnaire survey	
4. Technical staffs of SOB acquire essential technology of orthophoto making.	4-1 Operation manual of orthophoto making is made. 4-2 Plan of training of orthophoto making is made. 4-3 Training of orthophoto making is conducted and at least 70% of the participants of the training understand about the operation manual. 4-4 OJT of orthophoto making is conducted to at least 70% of SOB technical staffs in the respective field.		
5. Technical staffs of SOB acquire essential technology of DEM making	5-1 Operation manual of DEM making is made. 5-2 Training plan of DEM making is made. 5-3 Training of DEM making is conducted and at least 70% of the participants of the training understand about the operation manual. 5-4 OJT of DEM making is conducted to at least 70% of SOB technical staffs in the respective field.		
6. Technical staffs of SOB acquire essential technology of digital plotting.	6-1 Operation manual of digital plotting is made. 6-2 Training plan of digital plotting is made. 6-3 Training of digital plotting is conducted and at least 70% of the participants of the training understand about the operation manual. 6-4 OJT of digital plotting is conducted to at least 70% of SOB technical staffs in the respective field.		
7. Technical staffs of SOB acquire essential technology of digital compilation.	7-1 Operation manual of digital compilation is made. 7-2 Training plan of digital compilation is made. 7-3 Training of digital compilation is conducted and at least 70% of the participants of the training understand about the operation manual. 7-4 OJT of digital compilation is conducted to at least 70% of SOB technical staffs in the respective field.		
8. Technical staffs of SOB acquire essential technology about construction and management of GIS database.	8-1 Operation manual of construction and management of GIS database is made. 8-2 Training plan of construction and management of GIS database is made. 8-3 Training of construction and management of GIS database is conducted and at least 70% of the participants of the training understand about the operation manual. 8-4 OJT of construction and management of GIS database is conducted to at least 70% of SOB technical staffs in the respective field.		
~~9-1 Technical staffs of SOB improve their skills in printing map.~~	~~9-1-1 Operation manual of printing map is made.~~ ~~9-1-2 Training plan of printing map is made.~~ ~~9-1-3 Training of printing map is conducted and at least 70% of the participants of the training understand about the operation manual.~~ ~~9-1-4 OJT of printing is conducted to at least 70% of technical staffs in the respective field.~~		
~~9-2 Printing equipment of SOB is operational with a good condition~~	~~9-2-1 Maintenance plan is determined.~~ ~~9-2-2 All units of printing equipments which the IDMS project requires are well maintained.~~	~~Maintenance plan~~ ~~Maintenance record~~	
10. Technical staffs of SOB acquire essential technology about geoid model creation.	10-1 Operation manual of geoid model is made. 10-2 Geoid model is made. 10-3 Training of geoid model creation is conducted and at least of 70% of the participants of the training understand about the operation manual 10-4 OJT of geoid model creation is conducted to at least 70% of SOB technical staffs in the respective field.	- Operational manual - Created Geoid model - Training record - Questionnaire survey	
11. Technical staffs of SOB acquire essential technology of project planning, project management and trouble shooting for the implementation of IDMS.	11-1 Number of errors of Digital Topographic data is decreased. 11-2 The staffs of SOB are able to manage the IDMS Project by using EVM method.	- Prepared project plan - Training record - OJT record - Quality control record - Schedule management record	
12. IDMS project of SOB and digital maps/digital Data are recognized, and system for using effectively by users is established.	12-1 Dissemination seminar is held at least once a year. 12-2 70 % of participants satisfaction to the contents of seminar. 12-3 Technical meeting with the related organization for utilization of project product is held. 12-4 The information of digital map is updated periodically such as web site, brochure, etc.	- Seminar record - Procurement Method - Interviews for related organization	

Activities

1-1 To make Specifications for digital mapping
1-2 To translate Specifications into Bengalee
1-3 To provide overall technical support to IDMS project
1-4 To provide overall management support to IDMS project
2-1 To conduct lecture of photogrammetry theory
2-2 To conduct lecture of aerial triangulation theory
3-1 To make a training plan of aerial triangulation technique
3-2 To conduct technical training of aerial triangulation technique
3-3 To conduct training of quality and schedule control
3-4 To make Operation Manual of aerial triangulation
~~3-5 To translate Operation Manual into Bengalee~~
4-1 To make a training plan for orthophoto making technique
4-2 To conduct technical training of orthophoto making technique
4-3 To conduct training of quality and schedule control
4-4 To make Operation Manual about orthophoto making technique
~~4-5 To translate Operation Manual into Bengalee~~
5-1 To make a training plan of DEM making technique
5-2 To conduct technical training of DEM making technique
5-3 To conduct training of quality and schedule control
5-4 To make Operation Manual of DEM making technique
~~5-5 To translate Operation Manual into Bengalee~~
6-1 To make a training plan of digital plotting technique
6-2 To conduct technical training of digital plotting technique
6-3 To conduct training of quality and schedule control
6-4 To make Operation Manual of digital plotting technique

Input

Bangladesh Side

1. Assignment of counterparts personnel
- Project manager
- Aerial triangulation
- Ortho image
- DEM
- Digital plotting
- Digital compilation
- GIS map data
- Printing
- Geoid model

2. Facilities
- Office room for Japanese experts
- Telephone line and internet connection

(Reference)

3. IDMS Project
- Procurement of photogrammetric equipment
- Conduct of aerial photography
- Purchase of satellite image

Japanese Side

1. Assignment of Japanese experts
- Project leader
- Chief / Technical specifications
- Photogrammetry / Aerial triangulation Theory
- Aerial triangulation, Orthophoto making and DEM making (1)
- Aerial triangulation, Orthophoto making and DEM making (2)
- Digital mapping
- Digital compilation
- GIS database
- Printing
- Geoid model

2. Training in Japan
- Topographic maps and data management
- Topographic maps and data utilization

- Procurement of necessary equipment is done according to the schedule by SOB.
- Aerial photo is taken according to the schedule by SOB.
- Adequate number of technical staff of SOB will be assigned.

Precondition

~~6-5 To translate Operation Manual into Bengalee~~	- Renovation of working space		
7-1 To make a training plan of digital compilation technique	- Conduct of field works		
7-2 To conduct technical training of digital compilation technique	- Conduct of indoor works		
7-3 To conduct training of quality and schedule control	- Hold of Seminar		
7-4 To make Operation Manual of digital compilation technique			
~~7-5 To translate Operation Manual into Bengalee~~			
8-1 To make a training plan of construction and management of GIS database			
8-2 To conduct technical training of construction and management of GIS database			
8-3 To conduct training of quality and schedule control			
8-4 To make Operation Manual of construction and management of GIS database			
~~8-5 To translate Operation Manual into Bengalee~~			
~~9-1 To make Maintenance Plan of printing machine~~			
~~9-2 To make a training plan of printing technique~~			
~~9-3 To conduct technical training of printing technique~~			
~~9-4 To conduct training of quality and schedule control~~			
~~9-5 To make Operation Manual of printing technique~~			
~~9-6 To translate Operation Manual into Bengalee~~			
10-1 To make a training plan of geoid model creation technique			
10-2 To conduct technical training of geoid model creation technique			
10-3 To create geoid model			
10-4 To make Operation manual of geoid model creation			
~~10-5 To translate Operation Manual into Bengalee~~			
11-1 To conduct OJT for project planning of digital mapping			
11-2 To conduct lecture of project management for digital mapping			
11-3 To conduct OJT for trouble shooting of digital mapping			
11-4 To conduct OJT for quality control of digital mapping			
11-5 To conduct schedule control of digital mapping			
12-1 To hold seminars for related organizations and stake holders			
12-2 To promote cooperation with related organizations by provision of product information, sample data, and technical support.			
12-3 To advise SOB about establishment of publishing and reselling methods and provision system.			

Appendix 3.4 PDM of BDMAP (Version 4.0, 27 March 2012)

Project Design Matrix of BDMAP

Cooperation Period: July 2009 - March 2014 (5 years)
Target Group: SOB
Implementation Agency: Survey of Bangladesh (SOB)
Working Area: Dhaka
Made on 27 March 2012, Ver.4.0

Narratives Summary	Indicators	Means of Verification	Important Assumptions
Overall Goal 1. SOB implements the project of "Improvement of Digital Mapping System of Survey of Bangladesh" (IDMS).	1. SOB will provides 1:25,000 and 1:5,000 scale topographic maps and database to government and private users.	- Project report - Delivery record of topographic maps and data	
Project Purpose 1. Technical staff of SOB will develop their skills enough to implement the digital mapping in the scale of 1:5,000 and 1:25,000, and actual work of IDMS is implemented correctly and smoothly.	1-1 The organization for IDMS is organized in SOB and an appropriate amount of staff are allocated for IDMS. 1-2 Technical staff of SOB acquire the essential technology of digital mapping in order to implement IDMS 1-3 Technical staff of SOB acquire the planning, management and trouble shooting capabilities for IDMS.. 1-4 IDMS is implemented according to the schedule	- Project report - Actual work progress of IDMS Project - Questionnaire survey - Actual work products of IDMS Project	- Necessary budget to produce digital map and database will be continuously allocated to SOB. - The other technical areas which are not subjects of JICA technical transfer project also have enough ability to conduct the IDMS project. - Trained staff of SOB are retained in their department during the project implementation.
Outputs 1. SOB has the specifications of the process and products of digital mapping.	1-1 Specifications of process and product of the digital mapping is determined. 1-2 Specifications of process and product of digital mapping is introduced to all relative department of SOB 1-3 IDMS is implemented based on the specifications of process and product of the digital mapping by SOB. 1-4 Specifications of process and product of the digital mapping is amended, if necessary	- Copy of the Specifications - Project report - Questionnaire survey - Actual work products of IDMS Project	
2 Technical staff of SOB acquire the capabilities of planning, management and trouble shooting of digital mapping.	2-1 OJT of project planning for digital mapping is conducted. 2-2 Training of project management is conducted. 2-3 OJT of trouble-shooting is conducted. 2-4 OJT of quality control is conducted. 2-5 IDMS project is completed as planned.	- Produced documents - Training materials - Training record - Questionnaire survey - Actual work products of IDMS Project	
3 Technical staff of SOB understand the theory of photogrammetry and aerial triangulation.	3-1 Training of photogrammetry is conducted and at least 70 % of participants to the training understand the theory of photogrammetry. 3-2 Training for aerial triangulation is conducted and at least 70% of the participants to the training understand the theory of aerial triangulation.	- Project report - Training materials - Training record - Questionnaire survey	
4 Technical staff of SOB acquire essential technology of aerial triangulation. And the technical staff in charge of aerial triangulation acquire the capabilities of planning, management and trouble-shooting for aerial triangulation of IDMS Project.	4-1 Operation manual of aerial triangulation is made. 4-2 Training plan of aerial triangulation is made. 4-3 Training for aerial triangulation is conducted. 4-4 OJT for aerial triangulation planning, management and trouble-shooting is conducted. 4-5 Aerial triangulation is implemented based on the result of technical training and OJT as planned.	- Project report - Operation manual - Training plan - Technical training record - Practical examination - Paper examination - Questionnaire survey - Operation plan - Trouble-shooting record - Actual work products of IDMS Project	
5 Technical staff of SOB acquire essential technology of orthophoto making. And the technical staff in charge of orthophoto making acquire the capabilities of planning, management and trouble-shooting for orthophoto making of IDMS.	5-1 Operation manual of orthophoto making is made. 5-2 Training plan of orthophoto making is made. 5-3 Training for orthophoto making is conducted. 5-4 OJT for orthophoto making planning, management and trouble-shooting is conducted. 5-5 Orthophoto making is implemented based on the result of technical training and OJT as planned.		
6 Technical staff of SOB acquire essential technology of DEM making. And the technical staff in charge of DEM making acquire the capabilities of planning, management and trouble-shooting for DEM making of IDMS.	6-1 Operation manual of DEM making is made. 6-2 Training plan of DEM making is made. 6-3 Training for DEM making is conducted. 6-4 OJT for DEM making planning, management and trouble-shooting is conducted. 6-5 DEM making is implemented based on the result of technical training and OJT as planned.		
7 Technical staff of SOB acquire essential technology of digital plotting. And the technical staff in charge of digital plotting acquire the capabilities of planning, management and trouble-shooting of digital plotting of IDMS.	7-1 Operation manual of digital plotting is made. 7-2 Training plan of digital plotting is made. 7-3 Training for digital plotting is conducted. 7-4 OJT for digital plotting planning, management and trouble-shooting is conducted. 7-5 Digital plotting is implemented based on the result of technical training and OJT as planned.		
8 Technical staff of SOB acquire essential technology of digital compilation. And the technical staff in charge of digital compilation acquire the capabilities of planning, management and trouble-shooting of digital compilation of IDMS.	8-1 Operation manual of digital compilation is made. 8-2 Training plan of digital compilation is made. 8-3 Training for digital compilation is conducted. 8-4 OJT for digital compilation planning, management and trouble-shooting is conducted. 8-5 Digital compilation is implemented based on the result of technical training and OJT as planned.		
9 Technical staff of SOB acquire essential technology of construction and management of GIS database. And the technical staff in charge of GIS section acquire the capabilities of planning, management and trouble-shooting of GIS database.	9-1 Operation manual for construction and management of GIS database is made. 9-2 Training plan for construction and management of GIS database is made. 9-3 Training for construction and management of GIS database is conducted. 9-4 OJT for construction and management of GIS database is conducted. 9-5 Construction and management of GIS database is implemented based on the result of technical training and OJT as planned		
10 Technical staff of SOB acquire essential technology for the implementation of IDMS except above mentioned items. And the technical staff in charge acquire the capabilities of planning, management and trouble-shooting of these works of IDMS.	10-1 The flight plan for aerial photography, GCP plan, sheet index plan, sheet numbering plan and etc are made 10-2 Technical training and OJT for signal establishment for aerial photography and pricking are conducted. 10-3 Training for field identification is conducted. 10-4 Technical staff of SOB acquire the capabilities of planning, management and trouble-shooting of above-mentioned works of IDMS. 10-5 Operations above mentioned is implemented based on the result of training and OJT as planned.		
11 IDMS project of SOB and the mapping products are widely known and effectively utilized. And it shall be established and organized the structure in order to provide them to users smoothly.	11-1 Concerned organizations, private companies, civil users and others that need the mapping products obtain the information of utilization about the product and IDMS. 11-2 In order to utilize effectively the products, collaboration with the concerned organization shall be promoted. 11-3 In order to obtain smoothly the products for users, the publication and provision system shall be established	- Implementation record of seminar - Procedure to obtain the products - Hearing to the concerned organizations	
12 Technical staff of SOB acquire essential technology of geoid model creation.	12-1 Operation manual of geoid model is made. 12-2 Geoid model is made. 12-3 Training of geoid model creation is conducted and at least of 70% of the participants of the training understand about the operation manual 12-4 OJT of geoid model creation is conducted to at least 70% of SOB technical staffs in the respective field	- Operation manual - Geoid model - Training record - Questionnaire survey	
13 Technical staff of SOB acquire essential technology of secular change correction of digital maps. And the staff of SOB in charge acquire the capabilities of planning, management and trouble-shooting of secular change correction of digital maps.	13-1 Operation manual for secular change correction is made. 13-2 Training plan for secular change correction of digital maps is made. 13-3 Training for secular change correction of digital maps is conducted.. 13-4 OJT for secular change correction of digital maps is conducted. 13-5 Secular change correction of digital maps is implemented based on the	- Project report - Operation manual - Training record - Operation plan - Trouble-shooting record - Actual work products of secular change correction - Questionnaire survey	

result of training and OJT as planed.

Activities

1-1 To make Specifications for digital mapping
1-2 To translate Specifications in to Bengalee
1-3 To provide overall technical support to IDMS project
1-4 To provide overall planning and management support to IDMS project
2-1 To conduct OJT of implementation plan for digital mapping
2-2 To conduct a lecture of project management
2-3 To conduct OJT of trouble-shooting
2-4 To conduct OJT of quality control
3-1 To conduct lecture of photogrammetry theory
3-2 To conduct lecture of aerial triangulation theory
4-1 To make a training plan of aerial triangulation technique
4-2 To conduct technical training of aerial triangulation
4-3 To conduct OJT of quality and schedule control
4-4 To make operation manual of aerial triangulation
4-5 To conduct OJT of aerial triangulation of planning, operation, trouble-shootir
5-1 To make a training plan of orthophoto making
5-2 To conduct technical training of orthophoto making
5-3 To conduct OJT of quality and schedule control
5-4 To make operation manual of orthophoto making
5-5 To conduct OJT of orthophoto making of planning, operation, trouble-shootir
6-1 To make a training plan of DEM making
6-2 To conduct technical training of DEM making
6-3 To conduct OJT of quality and schedule control
6-4 To make operation manual of DEM making
6-5 To conduct OJT of DEM making of planning, operation, trouble-shooting
7-1 To make a training plan of digital plotting
7-2 To conduct technical training of digital plotting
7-3 To conduct OJT of quality and schedule control
7-4 To make operation manual of digital plotting
7-5 To conduct OJT of digital plotting of planning, operation, trouble-shooting
8-1 To make a training plan of digital compilation
8-2 To conduct technical training of digital compilation
8-3 To conduct OJT of quality and schedule control
8-4 To make operation manual of digital compilation
8-5 To conduct OJT of digital compilation of planning, operation, trouble-shooting
9-1 To make a training plan of construction and management of GIS database
9-2 To conduct technical training of construction and management of GIS database
9-3 To conduct OJT of quality and schedule control
9-4 To make operation manual of construction and management of GIS database
9-5 To conduct OJT of construction and management of GIS database of planning, operation, trouble-shooting
10-1 To make plans except above items for IDMS
10-2 To conduct technical training and OJT of signal establishment for aeria photography and pricking
10-3 To conduct technical training and OJT of field identification
11-1 To conduct seminar for concerned organizations and private companies and others
11-2 To promote collaboration with concerned organizations based on provision of sample data, products information and technical support
11-3 To assist for establishment provision and publication system for users
12-1 To make a training plan of geoid model creation technique
12-2 To conduct technical training of geoid model creation technique
12-3 To create geoid model
12-4 To make operation manual of geoid model creation
13-1 To make a training plan of secular change correction of digital maps
13-2 To conduct technical training of secular change correction of digital maps
13-3 To conduct OJT of quality and schedule control
13-4 To make operation manual of secular change correction
13-5 To conduct OJT of secular change correction planning, management trouble-shooting

Inputs

Bangladesh Side

1. **Assignment of counterparts personnel**
- Project manager
- Aerial triangulation
- Ortho image
- DEM
- Digital plotting
- Digital compilation
- GIS map data
- Printing
- Geoid model

2. Facilities
- Office room for Japanese experts
- Telephone line and internet connection

3 IDMS Project
- To purchase the equipment of aerial photogrametry
- To take aerial photos
- To purchase satellite images
- To repair the operation space.
- To conduct field work
- To conduct office work
- To hold the seminar

Japanese Side

1. **Assignment of Japanese experts**
- Project leader (JICA long-term expert)
- Chief / Technical specifications
- Photogrammetry / Aerial triangulation Theory
- Aerial triangulation, Orthophoto making and DEM making (1)
- Aerial triangulation, Orthophoto making and DEM making (2)
- Digital mapping
- Digital compilation
- GIS database
- Geoid model (JICA short-term expert)

2. **Training in Japan**
- Topographic maps and data management
- Topographic maps and data utilization

- Procurement of necessary equipment is done according to the schedule by SOB.
- Aerial photo is taken according to the schedule by SOB.
- Adequate number of technical staff of SOB will be assigned.
- Necessary operation space is secured as scheduled.

Precondition

Appendix 5.1 Minutes of Meeting on the Work Plan for Bangladesh Digital Mapping Assistance Project (4th Year)

MINUTES OF MEETING
ON
WORK PLAN
FOR
BANGLADESH DIGITAL MAPPING ASSISTANCE PROJECT
(4TH YEAR)

AGREED UPON BETWEEN

SURVEY OF BANGLADESH
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

Dhaka, June 28, 2012

Colonel Mahmudun Nabi, psc
Director, Defense Survey Directorate
Survey of Bangladesh

Mr. Toru Watanabe
Leader of the JICA Project Team

The Team for Bangladesh Digital Mapping Assistance Project (BDMAP)(4th Year) (hereinafter referred to as "The Project Team" arrived at Dhaka, the People's Republic of Bangladesh on 16 June 2012 for the fourth year's activities of BDMAP.

The Project Team submitted the Work Plan of BDMAP (4th year) to Survey of Bangladesh and explained the outline of the 4th year's activities of BDMAP.

Both parties basically agreed the Work Plan of BDMAP (4th year) submitted by The Project Team.

Appendix 5.2 Minutes of Meeting on the Draft Final Report for Bangladesh Digital Mapping Assistance Project (4th Year)

MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR
BANGLADESH DIGITAL MAPPING ASSISTANCE PROJECT
(4th YEAR)

AGRED UPON BETWEEN

SURVEY OF BANGLADESH
AND
BANGLADESH DIGITAL MAPPING ASSISTANCE PROJECT TEAM

Dhaka, 12 August 2013

Colonel Mahmudun Nabi, psc
Director Defense Survey Directorate
Survey of Bangladesh

Mr. Toru Watanabe
Leader of the JICA Project Team,

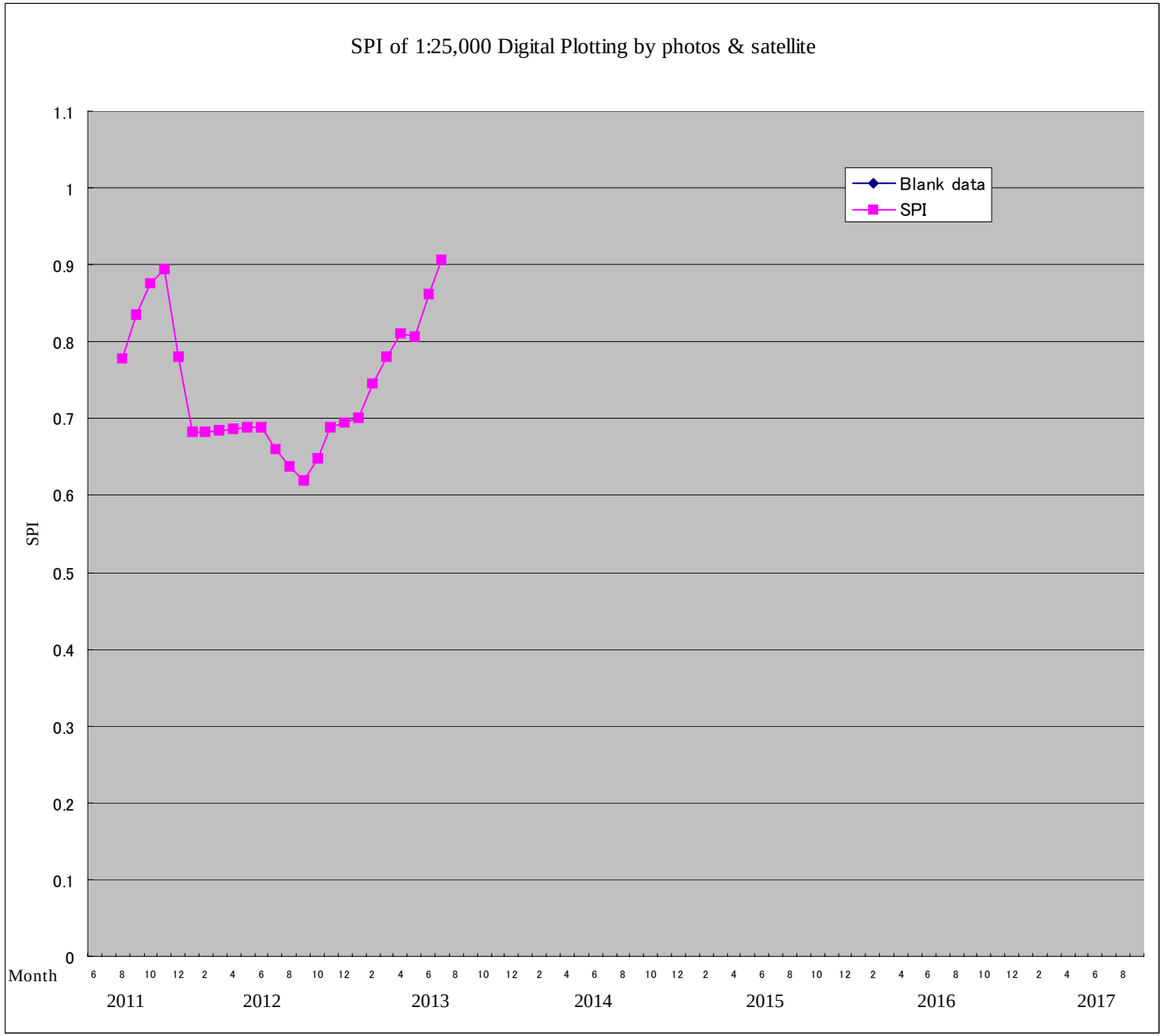
The Team for Bangladesh Digital Mapping Assistance Project (BDMAP) (4th Year) (hereinafter referred to as "The Project Team" submitted the Draft Final Report for BDMAP (4th Year) to Survey of Bangladesh (hereinafter referred to as "SOB").

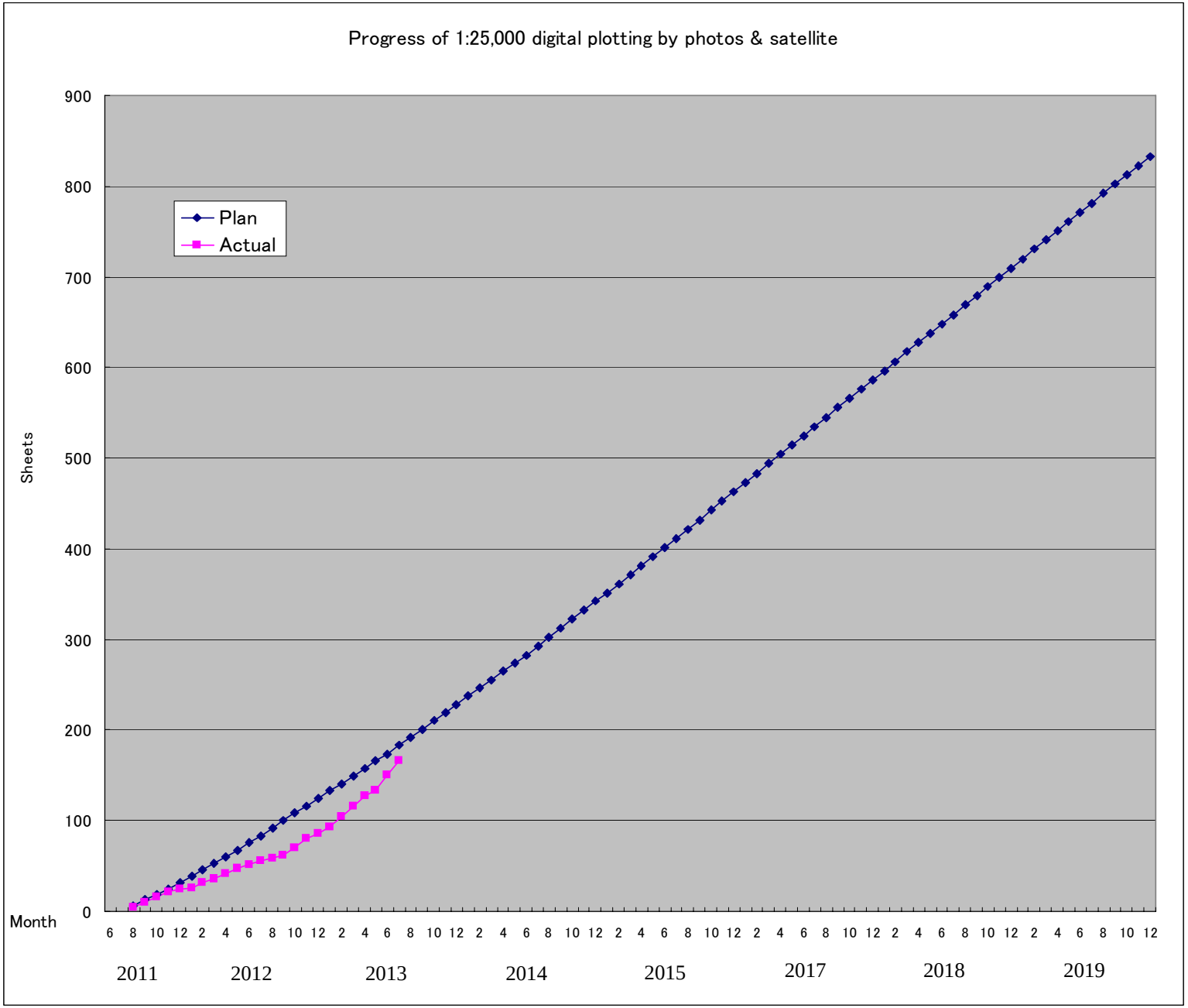
The Project Team explained the outline of the Draft Final Report for BDMAP (4th Year) to SOB on 5th August 2013.

The Project Team received the comments concerning the Draft Final Report for BDMAP (4th Year) from SOB on 7th August 2013.

Based on the comments from SOB, The Project Team will revise the Draft Final Report for BDMAP (4th Year) and will prepare the Final Report for BDMAP (4th Year) in Japan.

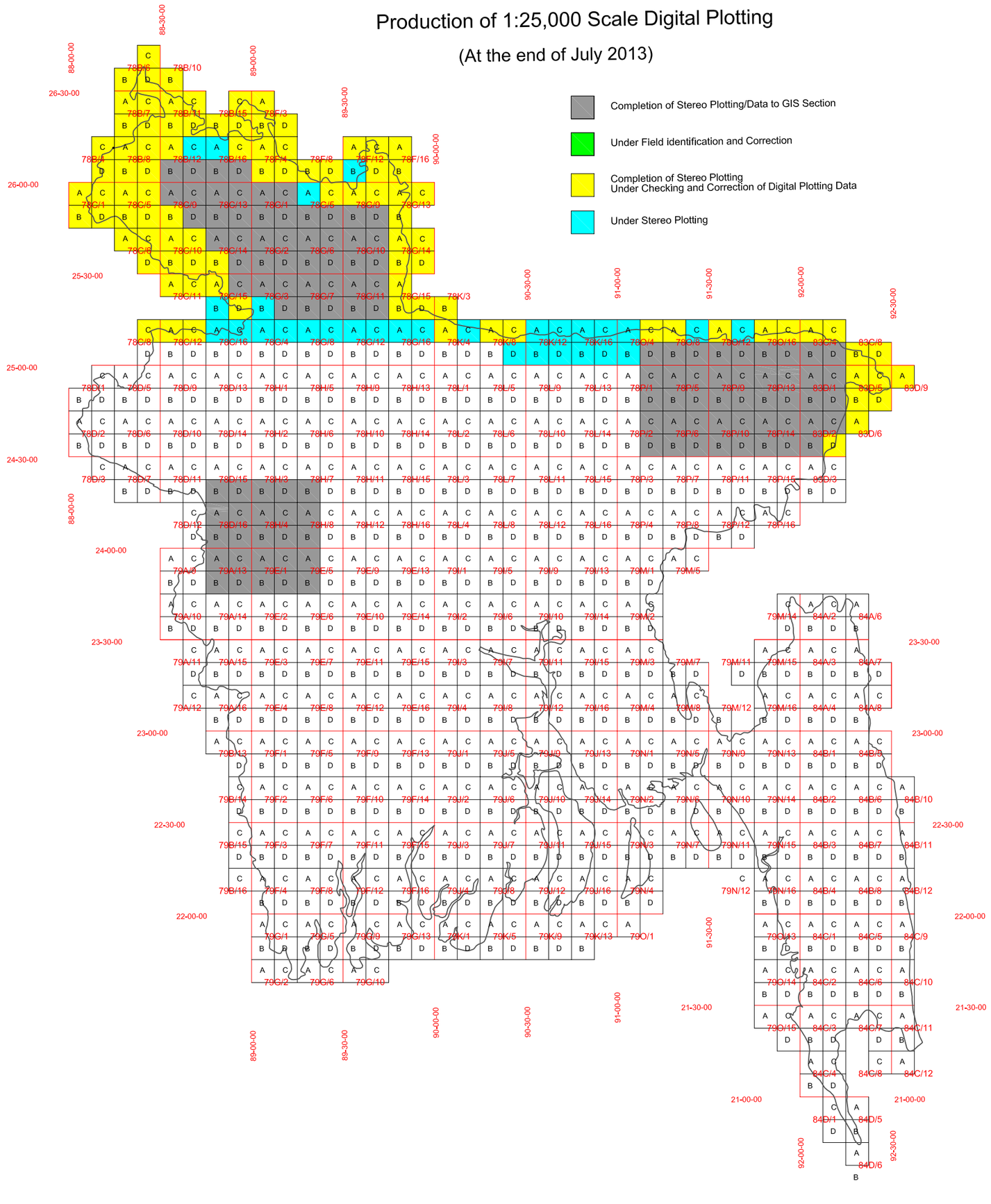
Appendix 9.1 Progress of 1:25,000 scale digital plotting at the end of July 2013


SPI of 1:25,000 Digital Plotting by photos & satellite
Blank data
SPI
SPI
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Month
6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8
2011
2012
2013
2014
2015
2016
2017


Progress of 1:25,000 digital plotting by photos & satellite
Plan
Actual
Sheets
900
800
700
600
500
400
300
200
100
0
Month
6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12
2011
2012
2013
2014
2015
2017
2018
2019

Production of 1:25,000 Scale Digital Plotting

(At the end of July 2013)



Progress of Digital Plotting 1:25,000 Scale

Block No.	Year	2011												2012												2013											
	Month	8			9			10			11			1			6			10			11			1			2			4			5			7		
	By	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total	Photo	Satellite	Total
Block-1																	3,316	0	3,316	4,506	0	4,506	5,341	0	5,341	6,514	14	6,528	7,103	246.75	7,350	7,548	3,106	10,654	8,258	3,120	11,379	8,376	5,808	14,184
Block-2																																					350	411	761
Block-3																																					700	656	1,356
Block-4		831	0	831	1,794	0	1,794	3,868	0	3,868	3,868	0	3,868	4,568	0	4,568	5,766	0	5,766	6,216	789	7,005	6,216	1,069	7,285	6,244	1,258	7,502	6,244	1,258	7,502	6,244	1,670	7,914	6,335	1,523	7,858	6,335	2,018	8,353
Block-5																																								
Block-6																																								
Block-7																				700	0	700	1,453	0	1452.5	2,354	0	2353.8	3,159	551	3710	3,386	551	3,938	3,763	613	4,375	3,763	613	4,375
Block-8																																								
Block-9																																								
Block-10																																								
Block-11																																								
Block-12																																								
Block-13																																								
Total (km^2)		831	0	831	1,794	0	1,794	3,868	0	3,868	3,868	0	3,868	4,568	0	4,568	9,082	0	9,082	11,422	789	12,212	13,010	1,069	14,079	15,111	1,272	16,384	16,506	2,056	18,562	17,178	5,327	22,505	18,356	5,255	23,611	19,523	9,506	29,029
Total (Sheet)		4.8	0	4.8	10.3	0	10.3	22.1	0	22.1	22.1	0	22.1	26.1	0	26.1	51.9	0	51.9	65.3	4.5	69.8	74.3	6.1	80.5	86.4	7.3	93.6	94.3	11.8	106.1	98.2	30.4	128.6	104.9	30.0	134.9	111.6	54.3	165.9

175 km^2

Progress of digital plotting **Block No.** 1 **Date** 31 **July** **2013**

	Index
Under data acquisition	0.50
Completion of data acquisition	0.80
Field identification and correction	0.90
Data was delivered to GSI	1.00

No.	Sheet No.	Area			End of January 2012				End of June 2012				End of October 2012				End of November 2012				End of January 2013				End of February 2013				End of April 2013				End of May 2013				End of July 2013			
					Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78B4C		0.3	0.3																									0.80	0.24			0.80	0.24			0.80	0.24
2	78B4D		0.7	0.7																									0.80	0.56			0.80	0.56			0.80	0.56
3	78C1A		0.2	0.2																									0.80	0.16			0.80	0.16			0.80	0.16
4	78C1B		0.1	0.1																									0.80	0.08			0.80	0.08			0.80	0.08
5	78C1C		0.9	0.9																									0.80	0.72			0.80	0.72			0.80	0.72
6	78C1D		0.6	0.6																																	0.80	0.48
7	78B6B		0.2	0.2																									0.80	0.16			0.80	0.16			0.80	0.16
8	78B6C		0.1	0.1																									0.50	0.05			0.50	0.05			0.80	0.08
9	78B6D		0.6	0.6																									0.50	0.30			0.50	0.30			0.80	0.48
10	78B7A		0.1	0.1																									0.80	0.08			0.80	0.08			0.80	0.08
11	78B7B		0.1	0.1																									0.80	0.08			0.80	0.08			0.80	0.08
12	78B7C		0.3	0.3																									0.50	0.15			0.50	0.15			0.80	0.24
13	78B7D		0.7	0.7																									0.80	0.56			0.80	0.56			0.80	0.56
14	78B8A		0.7	0.7																									0.80	0.56			0.80	0.56			0.80	0.56
15	78B8B		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
16	78B8C		1.0	1.0																									0.80	0.80			0.80	0.80			0.80	0.80
17	78B8D	1.0		1.0																	0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80				
18	78C5A		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
19	78C5B		0.8	0.8																									0.80	0.64			0.80	0.64			0.80	0.64
20	78C5C	1.0		1.0																	0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80				
21	78C5D	0.4	0.6	1.0																									0.50	0.20	0.50	0.30	0.50	0.20	0.50	0.30	0.80	0.32	0.80	0.48
22	78C6A		0.1	0.1																																			0.80	0.08
23	78C6C		0.7	0.7																									0.80	0.56			0.80	0.56			0.80	0.56
24	78C6D		0.2	0.2																									0.50	0.10			0.50	0.10			0.80	0.16
25	78B10B		0.1	0.1																									0.50	0.05			0.50	0.05			0.80	0.08
26	78B11A		0.8	0.8																									0.50	0.40			0.50	0.40			0.80	0.64
27	78B11B		0.9	0.9																									0.50	0.45			0.50	0.45			0.80	0.72
28	78B11C		0.3	0.3																									0.50	0.15			0.50	0.15			0.80	0.24
29	78B11D		0.7	0.7																									0.80	0.56			0.80	0.56			0.80	0.56
30	78B12A		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
31	78B12B	1.0		1.0													0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00		
32	78B12C		1.0	1.0																									0.50	0.50			0.50	0.50			0.50	0.50
33	78B12D	1.0		1.0									0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
34	78C9A	1.0		1.0																	0.50	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00		
35	78C9B	1.0		1.0													0.50	0.50			0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.80	0.80		
36	78C9C	1.0		1.0									0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
37	78C9D	1.0		1.0													0.50	0.50			0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			1.00	1.00		
38	78C10A		1.0	1.0																																	0.80	0.80		
39	78C10B		0.9	0.9																									0.50	0.45			0.50	0.45			0.80	0.72		
40	78C10C	1.0		1.0																	0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.80	0.80		
41	78C10D		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
42	78C11A		0.2	0.2																									0.50	0.10			0.50	0.10			0.80	0.16
43	78C11C		0.2	0.2																									0.80	0.16			0.80	0.16			0.80	0.16
44	78B15B		0.3	0.3																									0.50	0.15			0.50	0.15			0.80	0.24
45	78B15C		0.5	0.5																									0.50	0.25			0.50	0.25			0.80	0.40
46	78B15D		0.6	0.6																									0.50	0.30			0.50	0.30			0.80	0.48
47	78B16A		0.9	0.9																									0.50	0.45			0.50	0.45			0.50	0.45
48	78B16B	1.0		1.0									0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
49	78B16C		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
50	78B16D	0.9	0.1	1.0					0.50	0.45			0.50	0.45			0.80	0.72			0.80	0.72	0.80	0.08	0.90	0.81	0.90	0.09	0.90	0.81	0.90	0.09	1.00	0.9	1.00	0.10	1.00	0.90	1.00	0.10
51	78C13A	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
52	78C13B	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
53	78C13C	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
54	78C13D	1.0		1.0					0.50	0.50			0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
55	78C14A	1.0		1.0					0.50	0.50			0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
56	78C14B		0.9	0.9																																	0.50	0.45			0.80	0.72
57	78C14C	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
58	78C14D	0.6	0.4	1.0																	0.50	0.30			0.50	0.30			0.80	0.48	0.80	0.32	0.80	0.48	0.80	0.32	0.80	0.48	0.80	0.32
59	78C15A		0.4	0.4																											0.80	0.32			0.80	0.32			0.80	0.32
60	78C15B		0.2	0.2																											0.80	0.16			0.50	0.10			0.50	0.10
61	78C15C	0.2	0.8	1.0																	0.50	0.10			0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	1.00	0.2	1.00	0.80	1.00	0.20	1.00	0.80
62	78C15D		0.6	0.6																									0.80	0.48			0.80	0.48			0.80	0.48
63	78F3A		0.3	0.3																									0.50	0.15			0.50	0.15			0.80	0.24
64	78F3B		0.8	0.8																									0.50	0.40			0.50	0.40			0.80	0.64
65	78F3D		0.1	0.1																									0.50	0.05			0.50	0.05			0.80	0.08
66	78F4A		1.0	1.0																									0.50	0.50			0.50	0.50			0.80	0.80
67	78F4B	0.6	0.4	1.0																																	0.80	0.32		
68	78F4C	0.9	0.1	1.0																									0.50	0.45	0.50	0.05	0.50	0.45	0.50	0.05	0.50	0.45	0.80	0.08
69	78F4D	0.1	0.9	1.0																																			0.80	0.72
70	78G1A	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
71	78G1B	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
72	78G1C	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
73	78G1D	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
74	78G2A	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
75	78G2B	1.0		1.0									0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
76	78G2C	1.0		1.0					0.50	0.50			0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
77	78G2D	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
78	78G3A	0.5	0.5	1.0										0							0.50	0.25			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
79	78G3B		1.0	1.0																																			0.50	0.50
80	78G3C	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
81	78G3D	0.7	0.3	1.0																	0.50	0.35			0.50	0.35	0.50	0.15	0.80	0.56	0.80	0.24	0.80	0.56	0.80	0.24	0.80	0.56	0.80	0.24
82	78F8B		0.4	0.4																																			0.80	0.32
83	78F8D		0.2	0.2																																			0.80	0.16
84	78G5A	0.5	0.5	1.0																																	0.50	0.25	0.50	0.25
85	78G5B	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
86	78G5C		1.0	1.0																																			0.80	0.80
87	78G5D	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
88	78G6A	1.0		1.0									0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
89	78G6B	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
90	78G6C	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
91	78G6D	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
92	78G7A	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
93	78G7B	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
94	78G7C	1.0		1.0					0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
95	78G7D	1.0		1.0					0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
96	78F12A		0.2	0.2																																			0.80	0.16
97	78F12B		0.3	0.3																																			0.50	0.15
98	78F12C		0.6	0.6																																			0.80	0.48
99	78F12D		0.9	0.9																																			0.80	0.72
100	78G9A		0.9	0.9																																			0.80	0.72
101	78G9B	1.0		1.0					0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.9			0.90	0.90			1.00	1.00			1.00	1.00		
102	78G9C		1.0	1.0																																			0.80	0.80
103	78G9D	1.0		1.0					0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
104	78G10A	1.0		1.0					0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
105	78G10B	1.0		1.0					0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
106	78G10C	1.0		1.0					0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
107	78G10D	1.0		1.0					0.80	0.80			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
108	78G11A	1.0		1.0					0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
109	78G11B	1.0		1.0					0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
110	78G11C	1.0		1.0									0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
111	78G11D	1.0		1.0					0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
112	78F16A		0.1	0.1																																			0.80	0.08
113	78F16B		0.4	0.4																																			0.80	0.32
114	78G13A		0.8	0.8																																			0.80	0.64
115	78G13B		0.6	0.6																																			0.80	0.48
116	78G13C		0.1	0.1																																			0.80	0.08
117	78G14A		0.7	0.7																																			0.80	0.56
118	78G14B		0.8	0.8																																			0.80	0.64
119	78G15A		0.6	0.6																																			0.80	0.48
120	78G15B		0.7	0.7																																			0.80	0.56
121	78G15D		0.4	0.4																																			0.80	0.32
122	78K3B		0.2	0.2																																			0.80	0.16
	Total	50.4	42.6	93.0		0.00		0.00		18.95		0.00		25.75		0.00		30.52		0.00		37.22		0.08		40.59		1.41		43.13		17.75		47.19		17.83		47.86		33.19
	Km^2	8.820	7.455	16.275		0.00		0.00		3.316		0		4.506		0		5.341		0		6.514		14		7.103		246.75		7.548		3.106		8.258		3.120		8.376		5.808
		16.275			0.00				3.316				4.506				5.341				6.528				7.350				10.654				11.379				14.184			

175 km^2

Data was already delivered to GIS section from Digital Plotting Section.

Progress of digital plotting **Block No. 2** **Date 31 July 2013**

	Index
Under data acquisition	0.50
Completion of data acquisition	0.80
Field identification and correction	0.90
Data was delivered to GSI	1.00

No.	Sheet No	Area			End of May 2013				End of July 2013			
					Photo		Satellite		Photo		Satellite	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78D1B		0.2	0.2								
2	78D1C		0.6	0.6								
3	78D1D		0.8	0.8								
4	78D2A		0.5	0.5								
5	78D2B		0.3	0.3								
6	78D2C		1.0	1.0								
7	78D2D		1.0	1.0								
8	78C8C		0.3	0.3							0.80	0.24
9	78C8D		0.5	0.5								
10	78D5A		0.3	0.3								
11	78D5B		1.0	1.0								
12	78D5C		0.8	0.8								
13	78D5D		1.0	1.0								
14	78D6A		1.0	1.0								
15	78D6B		1.0	1.0								
16	78D6C	1.0		1.0								
17	78D6D	1.0		1.0								
18	78C12A		0.6	0.6							0.80	0.48
19	78C12B		1.0	1.0								
20	78C12C		0.6	0.6							0.80	0.48
21	78C12D		1.0	1.0								
22	78D9A		1.0	1.0								
23	78D9B	1.0		1.0								
24	78D9C	1.0		1.0								
25	78D9D	1.0		1.0								
26	78D10A	1.0		1.0								
27	78D10B	1.0		1.0								
28	78D10C	1.0		1.0								
29	78D10D	1.0		1.0								
30	78C16A		0.6	0.6							0.50	0.30
31	78C16B	1.0		1.0								
32	78C16C		0.7	0.7							0.50	0.35
33	78C16D	1.0		1.0								
34	78D13A	1.0		1.0								
35	78D13B	1.0		1.0								
36	78D13C	1.0		1.0								
37	78D13D	1.0		1.0								
38	78D14A	1.0		1.0								
39	78D14B	1.0		1.0								
40	78D14C	1.0		1.0								
41	78D14D	1.0		1.0								
42	78G4A		1.0	1.0							0.50	0.50
43	78G4B	1.0		1.0								
44	78G4C	1.0		1.0					0.50	0.50		
45	78G4D	1.0		1.0								
46	78H1A	1.0		1.0								
47	78H1B	1.0		1.0								
48	78H1C	1.0		1.0								
49	78H1D	1.0		1.0								
50	78H2A	1.0		1.0								
51	78H2B	1.0		1.0								
52	78H2C	1.0		1.0								
53	78H2D	1.0		1.0								
54	78G8A	1.0		1.0					0.50	0.50		
55	78G8B	1.0		1.0								
56	78G8C	1.0		1.0					0.50	0.50		
57	78G8D	1.0		1.0								
58	78H5A	1.0		1.0								
59	78H5B	1.0		1.0								
60	78H5C	1.0		1.0								
61	78H5D	1.0		1.0								
62	78H6A	1.0		1.0								
63	78H6B	1.0		1.0								
64	78H6C	1.0		1.0								
65	78H6D	1.0		1.0								
66	78G12A	1.0		1.0					0.50	0.50		
67	78G12B	1.0		1.0								
68	78H9A	1.0		1.0								
69	78H9B	1.0		1.0								
70	78H10A	1.0		1.0								
71	78H10B	1.0		1.0								
	Total	48.0	16.8	64.8		0.00		0.00		2.00		2.35
	Km^2	8,400	2,940	11,340		0		0		350		411
		11,340			0				761			

175 km^2

Data was already delivered to GIS section from Digital Plotting Section.

Progress of digital plotting **Block No. 3** **Date 31 July 2013**

	Index
Under data acquisition	0.50
Completion of data acquisition	0.80
Field identification and correction	0.90
Data was delivered to GSI	1.00

No.	Sheet No	Area			End of May 2013				End of July 2013			
					Photo		Satellite		Photo		Satellite	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78G12C	1.0		1.0					0.50	0.50		
2	78G12D	1.0		1.0								
3	78H9C	1.0		1.0								
4	78H9D	1.0		1.0								
5	78H10C	1.0		1.0								
6	78H10D	1.0		1.0								
7	78G16A	1.0		1.0					0.50	0.50		
8	78G16B	1.0		1.0								
9	78G16C		1.0	1.0							0.50	0.50
10	78G16D	1.0		1.0								
11	78H13A	1.0		1.0								
12	78H13B	1.0		1.0								
13	78H13C	1.0		1.0								
14	78H13D	1.0		1.0								
15	78H14A	1.0		1.0								
16	78H14B	1.0		1.0								
17	78H14C	1.0		1.0								
18	78H14D	1.0		1.0								
19	78K4A		0.9	0.9							0.80	0.72
20	78K4B	1.0		1.0								
21	78K4C		0.7	0.7							0.50	0.35
22	78K4D	1.0		1.0								
23	78L1A	1.0		1.0								
24	78L1B	1.0		1.0								
25	78L1C	1.0		1.0								
26	78L1D	1.0		1.0								
27	78L2A	1.0		1.0								
28	78L2B	1.0		1.0								
29	78L2C	1.0		1.0								
30	78L2D	1.0		1.0								
31	78K8A		0.6	0.6							0.80	0.48
32	78K8B	1.0		1.0								
33	78K8C		0.5	0.5							0.80	0.40
34	78K8D	1.0		1.0					0.50	0.50		
35	78L5A	1.0		1.0								
36	78L5B	1.0		1.0								
37	78L5C	1.0		1.0								
38	78L5D	1.0		1.0								
39	78L6A	1.0		1.0								
40	78L6B	1.0		1.0								
41	78L6C	1.0		1.0								
42	78L6D	1.0		1.0								
43	78K12A		0.5	0.5							0.50	0.25
44	78K12B	1.0		1.0					0.50	0.50		
45	78K12C		0.5	0.5							0.50	0.25
46	78K12D	1.0		1.0					0.50	0.50		
47	78L9A	1.0		1.0								
48	78L9B	1.0		1.0								
49	78L9C	1.0		1.0								
50	78L9D	1.0		1.0								
51	78L10A	1.0		1.0								
52	78L10B	1.0		1.0								
53	78L10C	1.0		1.0								
54	78L10D	1.0		1.0								
55	78K16A		0.5	0.5							0.50	0.25
56	78K16B	1.0		1.0					0.50	0.50		
57	78K16C		0.5	0.5							0.50	0.25
58	78K16D	1.0		1.0					0.50	0.50		
59	78L13A	1.0		1.0								
60	78L13B	1.0		1.0								
61	78L13C	1.0		1.0								
62	78L13D	1.0		1.0								
63	78L14A	1.0		1.0								
64	78L14B	1.0		1.0								
65	78L14C	1.0		1.0								
66	78L14D	1.0		1.0								
67	78O4A		0.6	0.6							0.50	0.30
68	78O4B	1.0		1.0					0.50	0.50		
69	78P1A	1.0		1.0								
70	78P1B	1.0		1.0								
71	78P2A	1.0		1.0								
72	78P2B	1.0		1.0								
	Total	62.0	6.3	68.3		0.00		0.00		4.00		3.75
	Km^2	10,850	1,103	11,953		0		0		700		656
		11,953			0				1,356			

175 km^2

Data was already delivered to GIS section from Digital Plotting Section.

Progress of digital plotting **Block No. 4** **Date 31 July 2013**

	Index
Under data acquisition	0.50
Completion of data acquisition	0.80
Field identification and correction	0.90
Data was delivered to GSI	1.00

No.	Sheet No.	Area			End of August 2011				End of September 2011				End of October 2011				End of November 2011				End of January 2012				End of June 2012				End of October 2012				End of November 2012				End of January 2013				End of February 2013				End of April 2013				End of May 2013				End of July 2013		
					Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78O4C		0.7	0.7																																																0.80	0.56
2	78O4D	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
3	78P1C	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
4	78P1D	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
5	78P2C	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
6	78P2D	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
7	78O8A		0.6	0.6																																																	0.80	0.48
8	78O8B	0.5	0.5	1.0	0.5	0.25			0.5	0.25			0.90	0.45			0.90	0.45			0.90	0.45			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
9	78O8C		0.3	0.3																																																0.50	0.15
10	78O8D	0.5	0.5	1.0					0.5	0.25			0.90	0.45			0.90	0.45			0.90	0.45			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
11	78P5A	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
12	78P5B	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
13	78P5C	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
14	78P5D	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
15	78P6A	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
16	78P6B	1.0		1.0	0.5	0.50			0.5	0.50			0.90	0.90			0.90	0.90			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
17	78P6C	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
18	78P6D	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
19	78O12A		0.3	0.3																																																0.80	0.24
20	78O12B	0.5	0.5	1.0					0.5	0.25			0.50	0.25			0.50	0.25			0.90	0.45			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
21	78O12C		0.2	0.2																																																0.50	0.10
22	78O12D	0.5	0.5	1.0									0.50	0.25			0.50	0.25			0.90	0.45			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
23	79P9A	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
24	79P9B	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
25	79P9C	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
26	79P9D	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
27	78P10A	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
28	78P10B	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
29	78P10C	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
30	78P10D	1.0		1.0					0.5	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
31	78O16A		0.4	0.4																																																0.80	0.32
32	78O16B	0.5	0.5	1.0									0.50	0.25			0.50	0.25			0.50	0.25			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
33	78O16C		0.5	0.5																																																0.80	0.40
34	78O16D	0.5	0.5	1.0									0.50	0.25			0.50	0.25			0.50	0.25			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
35	78P13A	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
36	78P13B	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
37	78P13C	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
38	78P13D	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
39	78P14A	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
40	78P14B	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
41	78P14C	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
42	78P14D	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
43	83C4A		0.5	0.5																																																0.50	0.25			0.80	0.40
44	83C4B	0.5	0.5	1.0									0.50	0.25			0.50	0.25			0.50	0.25			0.90	0.45			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
45	83C4C		0.1	0.1																																																0.50	0.05			0.80	0.08
46	83C4D	0.1	0.8	0.9									0.50	0.05			0.50	0.05			0.50	0.05			0.90	0.09			0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	1.00	0.10	1.00	0.80	1.00	0.10	1.00	0.80
47	83D1A	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
48	83D1B	1.0		1.0									0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00			1.00	1.00		
49	83D1C	0.2	0.8	1.0									0.50	0.10			0.50	0.10			0.50	0.10			0.80	0.16			0.80	0.16			0.80	0.16	0.50	0.4	0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	1.00	0.20			1.00	0.20		
50	83D1D	0.1	0.8	0.9									0.50	0.05			0.50	0.05			0.50	0.05			0.08	0.01			0.80	0.08			0.80	0.08	0.50	0.4	0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	0.90	0.09	0.90	0.72	1.00	0.10			1.00	0.10		
51	83D2A	0.8	0.2	1.0									0.50	0.40			0.50	0.40			0.50	0.40			0.80	0.64			0.80	0.64	0.80	0.16	0.80	0.64	0.80	0.16	0.90	0.72	0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	0.90	0.18	1.00	0.80	1.00	0.20	1.00	0.80	1.00	0.20
52	83D2B	0.4	0.6	1.0									0.50	0.20			0.50	0.20			0.50	0.20			0.80	0.32			0.80	0.32	0.80	0.48	0.80	0.32	0.80	0.48	0.90	0.36	0.90	0.54	0.90	0.36	0.90	0.54	0.90	0.36	0.90	0.54	1.00	0.40	1.00	0.60	1.00	0.40	1.00	0.60
53	83D2C	0.1	0.9	1.0									0.50	0.05			0.50	0.05			0.50	0.05			0.80	0.08			0.80	0.08			0.80	0.08	0.50	0.45	0.90	0.09	0.90	0.81	0.90	0.09	0.90	0.81	0.90	0.09	0.90	0.81	1.00	0.10	1.00	0.90	1.00	0.10	1.00	0.90
54	83D2D		0.7	0.7																																	0.50	0.35					0.50	0.35					0.80	0.56			0.80	0.56			0.80	0.56		
55	83C8B		0.6	0.6																																																0.50	0.30			0.80	0.48		
56	83C8D		0.1	0.1																																																0.80	0.08			0.80	0.08		
57	83D5A		0.8	0.8																																																0.80	0.64			0.80	0.64		
58	83D5B		0.2	0.2																																																0.80	0.16			0.80	0.16		
59	83D5C		0.7	0.7																																																0.80	0.56			0.80	0.56		
60	83D5D		0.1	0.1																																																0.50	0.05			0.80	0.08		
61	83D6A		0.1	0.1																																																0.50	0.05			0.80	0.08		
62	83D9A		0.2	0.2																																																			0.80	0.16		
	Total	36.2	14.7	50.9		4.75		0.00		10.25		0.00		22.10		0.00		22.10		0.00		26.10		0.00		32.95		0.00		35.52		4.51		35.52		6.11		35.68		7.19		35.68		7.19		35.68		9.54		36.20		8.70		36.20		11.53
	Km^2	6,335	2,573	8,908		831		0		1,794		0		3,868		0		3,868		0		4,568		0		5,766		0		6,216		789		6,216		1,069		6,244		1,258		6,244		1,258		6,244		1,670		6,335		1,523		6,335		2,018
				8,908		831				1,794				3,868				3,868				4,568				5,766				7,005				7,285				7,502				7,502				7,914				7,858				8,353		

175 km^2

Data was already delivered to GIS section from Digital Plotting Section.

Progress of digital plotting **Block No. 7** **Date 31 July 2013**

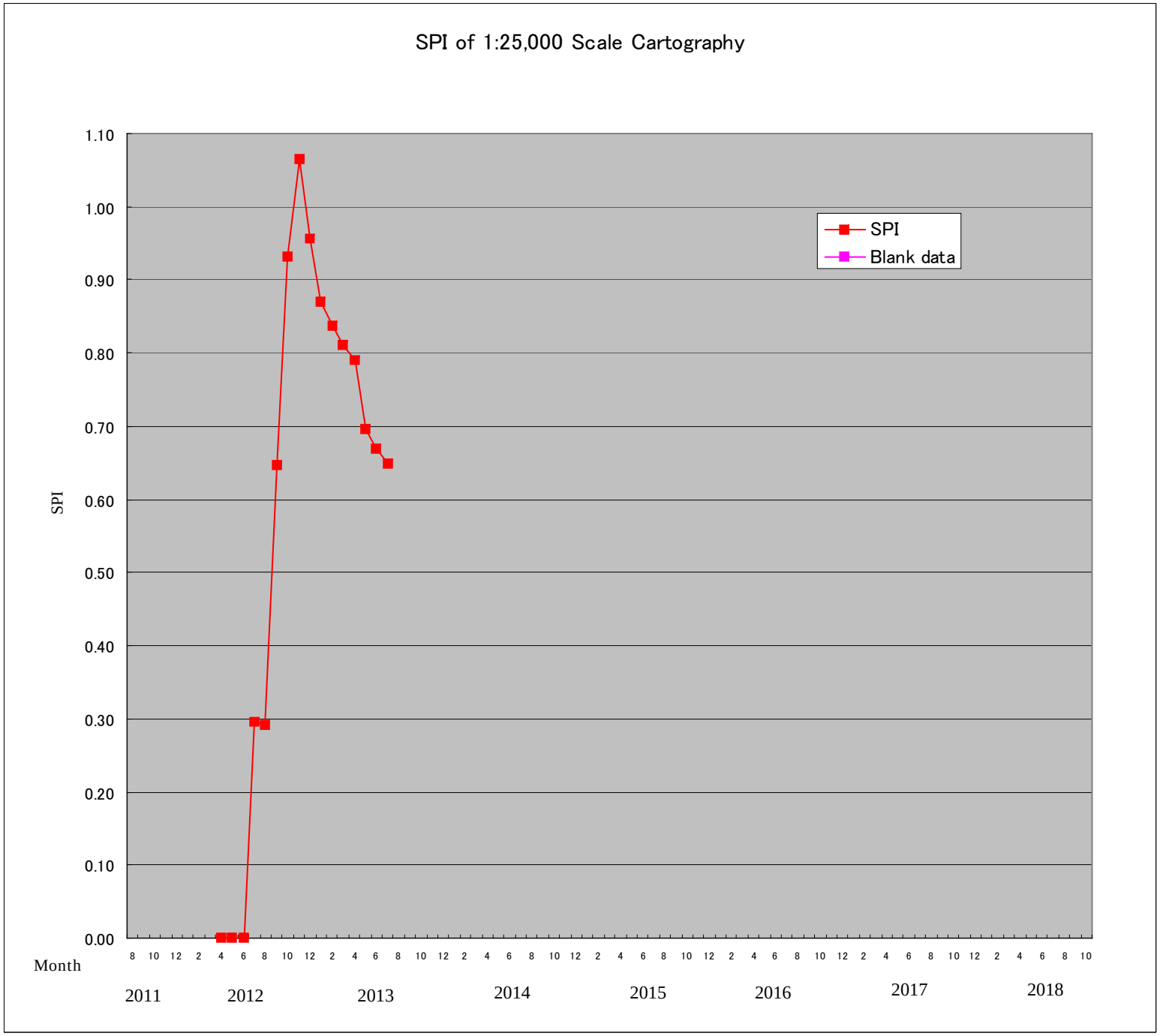
	Index
Under data acquisition	0.50
Completion of data acquisition	0.80
Field identification and correction	0.90
Data was delivered to GSI	1.00

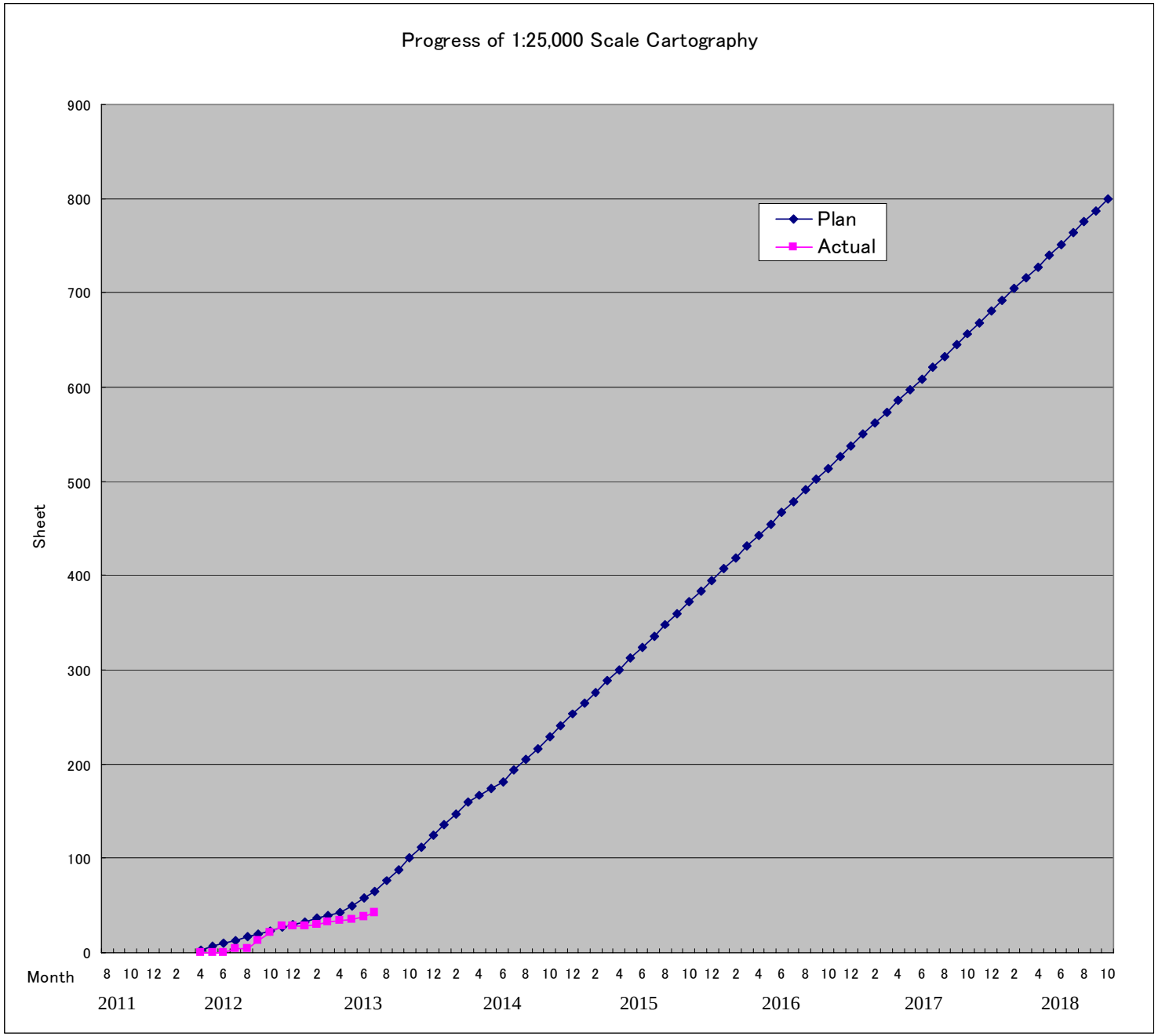
No.	Sheet No.	Area			End of October 2012				End of November 2012				End of January 2013				End of February 2013				End of April 2013				End of May 2013				End of July 2013			
					Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite		Photo		Satellite	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78D3C		0.5	0.5																												
2	78D7A		0.7	0.7																												
3	78D7B		0.4	0.4																												
4	78D7C		0.9	0.9																												
5	78D7D		0.6	0.6																												
6	78D11A		1.0	1.0																												
7	78D11B		0.8	0.8																												
8	78D11C	1.0		1.0																												
9	78D11D		0.7	0.7																												
10	78D12C		0.6	0.6																												
11	78D12D		0.6	0.6																												
12	79A9A		0.5	0.5																												
13	79A9B		0.5	0.5																												
14	79A9C		0.5	0.5																												
15	79A9D		1.0	1.0																												
16	79A10A		0.6	0.6																												
17	79A10C		1.0	1.0																												
18	78D15A	1.0		1.0																												
19	78D15B	0.4	0.6	1.0									0.50	0.20			0.90	0.36	0.90	0.54	0.90	0.36	0.90	0.54	1.00	0.40	1.00	0.60	1.00	0.40	1.00	0.60
20	78D15C	1.0		1.0																												
21	78D15D	1.0		1.0					0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
22	78D16A	0.2	0.8	1.0									0.50	0.10			0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	1.00	0.20	1.00	0.80	1.00	0.20	1.00	0.80
23	78D16B	0.2	0.8	1.0									0.50	0.10			0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	1.00	0.20	1.00	0.80	1.00	0.20	1.00	0.80
24	78D16C	1.0		1.0	0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
25	78D16D	1.0		1.0	0.50	0.50			0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
26	79A13A	0.2	0.8	1.0									0.50	0.10			0.90	0.18	0.90	0.72	0.90	0.18	0.90	0.72	1.00	0.20	1.00	0.80	1.00	0.20	1.00	0.80
27	79A13B	0.5	0.5	1.0									0.50	0.25			0.90	0.45	0.90	0.45	0.90	0.45	0.90	0.45	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50
28	79A13C	1.0		1.0					0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
29	79A13D	1.0		1.0					0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
30	79A14A	1.0		1.0																												
31	79A14C	1.0		1.0																												
32	78H3A	1.0		1.0																												
33	78H3B	1.0		1.0					0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
34	78H3C	1.0		1.0																												
35	78H3D	1.0		1.0					0.5	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
36	78H4A	1.0		1.0	0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
37	78H4B	1.0		1.0	0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
38	78H4C	1.0		1.0	0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
39	78H4D	1.0		1.0	0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
40	79E1A	1.0		1.0	0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
41	79E1B	1.0		1.0									0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00		
42	79E1C	1.0		1.0	0.50	0.50			0.80	0.80			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
43	79E1D	1.0		1.0									0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00		
44	79E2A	1.0		1.0																												
45	79E2C	1.0		1.0																												
46	78H7A	1.0		1.0																												
47	78H7B	1.0		1.0									0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
48	78H7C	1.0		1.0																												
49	78H7D	1.0		1.0																												
50	78H8A	1.0		1.0					0.50	0.50			0.80	0.80			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
51	78H8B	1.0		1.0					0.50	0.50			0.50	0.50			0.90	0.90			0.90	0.90			1.00	1.00			1.00	1.00		
52	78H8C	1.0		1.0																												
53	78H8D	1.0		1.0																												
54	79E5A	1.0		1.0					0.50	0.50			0.50	0.50			0.80	0.80			0.90	0.90			1.00	1.00			1.00	1.00		
55	79E5B	1.0		1.0									0.50	0.50			0.50	0.50			0.90	0.90			1.00	1.00			1.00	1.00		
56	79E5C	1.0		1.0																												
57	79E5D	1.0		1.0																												
58	79E6A	1.0		1.0																												
59	79E6C	1.0		1.0																												
60	78H11A	1.0		1.0																												
61	78H11B	1.0		1.0																												
62	78H12A	1.0		1.0																												
63	78H12B	1.0		1.0																												
64	79E9A	1.0		1.0																												
65	79E9B	1.0		1.0																												
66	79E10A	1.0		1.0																												
	Total	46.5	14.4	60.9		4.00		0.00		8.30		0.00		13.45		0.00		18.05		3.15		19.35		3.15		21.50		3.50		21.50		3.50
	Km^2	8,138	2,520	10,658		700		0		1,453		0		2,354		0		3,159		551		3,386		551		3,763		613		3,763		613
		10,658			700				1,453				2,354				3,710				3,938				4,375				4,375			

175 km^2

Data was already delivered to GIS section from Digital Plotting Section.

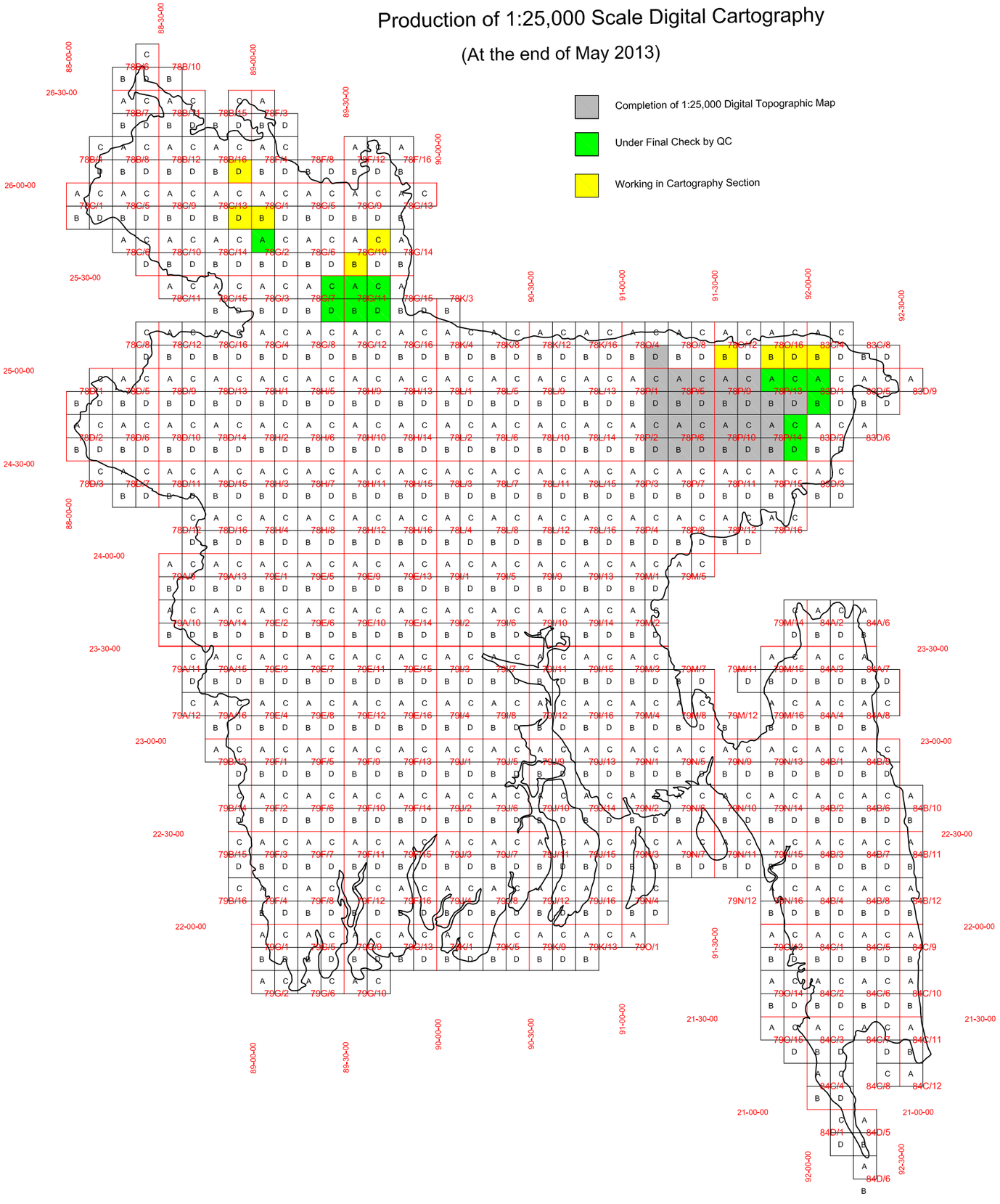
Appendix 9.2 Progress of 1:25,000 scale digital cartography at the end of July 2013


SPI of 1:25,000 Scale Cartography
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
SPI
SPI
Blank data
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10
Month
2011
2012
2013
2014
2015
2016
2017
2018


Progress of 1:25,000 Scale Cartography
Plan
Actual
Sheet
900
800
700
600
500
400
300
200
100
0
Month
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10
2011
2012
2013
2014
2015
2016
2017
2018

Production of 1:25,000 Scale Digital Cartography

(At the end of May 2013)



Progress of Digital Cartography 1:25,000 Scale

Block No.	Year	2012				2013			
	Month	7	8	10	11	1	4	5	7
Block-1							665	840	1,540
Block-2									
Block-3									
Block-4		683	840	3,780	4,918	5,023	5,268	5,268	5,670
Block-5									
Block-6									
Block-7									
Block-8									
Block-9									
Block-10									
Block-11									
Block-12									
Block-13									
Total (km2)		683	840	3,780	4,918	5,023	5,933	6,108	7,210
Total (Sheet)		3.9	4.8	21.6	28.1	28.7	33.9	34.9	41.2

175 km^2

Progress of Cartography **Block No. 1** **Date 31 July 2013**

	Index
Under cartography work	0.50
Data was delivered to QC	0.90
Completion	1.00

No.	Sheet No.	Area			2012				2013							
					10		12		1		4		5		7	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78B4C		0.3	0.3												
2	78B4D		0.7	0.7												
3	78C1A		0.2	0.2												
4	78C1B		0.1	0.1												
5	78C1C		0.9	0.9												
6	78C1D		0.6	0.6												
7	78B6B		0.2	0.2												
8	78B6C		0.1	0.1												
9	78B6D		0.6	0.6												
10	78B7A		0.1	0.1												
11	78B7B		0.1	0.1												
12	78B7C		0.3	0.3												
13	78B7D		0.7	0.7												
14	78B8A		0.7	0.7												
15	78B8B		1.0	1.0												
16	78B8C		1.0	1.0												
17	78B8D	1.0		1.0												
18	78C5A		1.0	1.0												
19	78C5B		0.8	0.8												
20	78C5C	1.0		1.0												
21	78C5D		1.0	1.0												
22	78C6A		0.1	0.1												
23	78C6C		0.7	0.7												
24	78C6D		0.2	0.2												
25	78B10B		0.1	0.1												
26	78B11A		0.8	0.8												
27	78B11B		0.9	0.9												
28	78B11C		0.3	0.3												
29	78B11D		0.7	0.7												
30	78B12A		1.0	1.0												
31	78B12B	1.0		1.0												
32	78B12C		1.0	1.0												
33	78B12D	1.0		1.0												
34	78C9A	1.0		1.0												
35	78C9B	1.0		1.0												
36	78C9C	1.0		1.0												
37	78C9D	1.0		1.0												
38	78C10A		1.0	1.0												
39	78C10B		0.9	0.9												
40	78C10C	1.0		1.0												
41	78C10D		1.0	1.0												
42	78C11A		0.2	0.2												
43	78C11C		0.2	0.2												
44	78B15B		0.3	0.3												
45	78B15C		0.5	0.5												
46	78B15D		0.6	0.6												
47	78B16A		0.9	0.9												
48	78B16B	1.0		1.0												
49	78B16C		1.0	1.0												
50	78B16D	1.0		1.0											0.50	0.50
51	78C13A	1.0		1.0												
52	78C13B	1.0		1.0												
53	78C13C	1.0		1.0												
54	78C13D	1.0		1.0											0.50	0.50
55	78C14A	1.0		1.0												
56	78C14B		0.9	0.9												
57	78C14C	1.0		1.0												
58	78C14D		1.0	1.0												
59	78C15A		0.4	0.4												
60	78C15B		0.0	0.0												
61	78C15C		1.0	1.0												
62	78C15D		0.6	0.6												
63	78F3A		0.3	0.3												
64	78F3B		0.8	0.8												
65	78F3D		0.1	0.1												
66	78F4A		1.0	1.0												
67	78F4B		1.0	1.0												
68	78F4C		0.2	0.2												
69	78F4D		0.9	0.9												
70	78G1A	1.0		1.0												
71	78G1B	1.0		1.0									0.50	0.50	0.50	0.50
72	78G1C	1.0		1.0												
73	78G1D	1.0		1.0												
74	78G2A	1.0		1.0									0.50	0.50	0.90	0.90
75	78G2B	1.0		1.0												
76	78G2C	1.0		1.0												
77	78G2D	1.0		1.0												
78	78G3A	0.5	0.5	1.0												
79	78G3B		1.0	1.0												
80	78G3C	1.0		1.0												
81	78G3D		1.0	1.0												
82	78F8B		0.4	0.4												
83	78F8D		0.2	0.2												
84	78G5A		1.0	1.0												
85	78G5B	1.0		1.0												
86	78G5C		1.0	1.0												
87	78G5D	1.0		1.0												
88	78G6A	1.0		1.0												
89	78G6B	1.0		1.0												
90	78G6C	1.0		1.0												
91	78G6D	1.0		1.0												
92	78G7A	1.0		1.0												
93	78G7B	1.0		1.0												
94	78G7C	1.0		1.0							0.50	0.50	0.50	0.50	0.90	0.90
95	78G7D	1.0		1.0							0.50	0.50	0.50	0.50	0.90	0.90
96	78F12A		0.2	0.2												
97	78F12B		0.3	0.3												
98	78F12C		0.6	0.6												
99	78F12D		0.9	0.9												
100	78G9A		0.9	0.9												
101	78G9B	1.0		1.0												
102	78G9C		1.0	1.0												
103	78G9D	1.0		1.0												
104	78G10A	1.0		1.0												
105	78G10B	1.0		1.0											0.50	0.50
106	78G10C	1.0		1.0											0.50	0.50
107	78G10D	1.0		1.0												
108	78G11A	1.0		1.0							0.50	0.50	0.50	0.50	0.90	0.90
109	78G11B	1.0		1.0							0.90	0.90	0.90	0.90	0.90	0.90
110	78G11C	1.0		1.0							0.50	0.50	0.50	0.50	0.90	0.90
111	78G11D	1.0		1.0							0.90	0.90	0.90	0.90	0.90	0.90
112	78F16A		0.1	0.1												
113	78F16B		0.4	0.4												
114	78G13A		0.8	0.8												
115	78G13B		0.6	0.6												
116	78G13C		0.1	0.1												
117	78G14A		0.7	0.7												
118	78G14B		0.8	0.8												
119	78G15A		0.6	0.6												
120	78G15B		0.7	0.7												
121	78G15D		0.4	0.4												
122	78K3B		0.2	0.2												
	Total	46.5	45.4	91.9								3.80		4.80		8.80
	Km^2	8,138	7,945	16,083								665		840		1,540

175 km^2

Data was already delivered from Cartography Section to Final QC Section.

Progress of Cartography (1:25,000 Scale) **Block No.** **4** **Date** **31** **July** **2013**

	Index
Under cartography work	0.50
Data was delivered to QC	0.90
Completion	1.00

No.	Sheet No.	Area (Sheet)			2012								2013							
					7		8		10		11		1		4		5		7	
		Photo	Satellite	Total	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress	Index	Progress
1	78O4C		0.7	0.7																
2	78O4D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
3	78P1C	1.0		1.0	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4	78P1D	1.0		1.0	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	78P2C	1.0		1.0	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
6	78P2D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
7	78O8A		0.6	0.6																
8	78O8B	0.5	0.5	1.0																
9	78O8C		0.3	0.3																
10	78O8D	0.5	0.5	1.0																
11	78P5A	1.0		1.0	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12	78P5B	1.0		1.0	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
13	78P5C	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
14	78P5D	1.0		1.0	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
15	78P6A	1.0		1.0	0.50	0.50	0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
16	78P6B	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
17	78P6C	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
18	78P6D	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
19	78O12A		0.3	0.3																
20	78O12B	0.5	0.5	1.0															0.50	0.50
21	78O12C		0.2	0.2																
22	78O12D	0.5	0.5	1.0																
23	78P9A	1.0		1.0			0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
24	78P9B	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
25	78P9C	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
26	78P9D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
27	78P10A	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
28	78P10B	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
29	78P10C	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
30	78P10D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
31	78O16A	0.0	0.4	0.4																
32	78O16B	0.5	0.5	1.0															0.50	0.50
33	78O16C	0.0	0.5	0.5																
34	78O16D	0.5	0.5	1.0															0.50	0.50
35	78P13A	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
36	78P13B	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00
37	78P13C	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
38	78P13D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00
39	78P14A	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00
40	78P14B	1.0		1.0					0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00
41	78P14C	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
42	78P14D	1.0		1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
43	83C4A		0.5	0.5																
44	83C4B	0.5	0.5	1.0															0.50	0.50
45	83C4C		0.1	0.1																
46	83C4D	0.1	0.8	0.9																
47	83D1A	1.0	0.0	1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
48	83D1B	1.0	0.0	1.0					0.50	0.50	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
49	83D1C	0.2	0.8	1.0																
50	83D1D	0.1	0.8	0.9																
51	83D2A	0.8	0.2	1.0																
52	83D2B	0.4	0.6	1.0																
53	83D2C		0.9	0.9																
54	83D2D		0.7	0.7																
55	83C8B		0.6	0.6																
56	83C8D		0.1	0.1																
57	83D5A		0.8	0.8																
58	83D5B		0.2	0.2																
59	83D5C		0.7	0.7																
60	83D5D		0.1	0.1																
61	83D6A		0.1	0.1																
	Total	36.1	14.5	50.6		3.90		4.80		21.60		28.10		28.70		30.10		30.10		32.40
	Km^2	6,318	2,538	8,855		683		840		3,780		4,918		5,023		5,268		5,268		5,670

175 km^2

Data was already delivered from Cartography Section to Final QC Section.

Appendix 9.3 Work schedule of 1:25,000 digital mapping (EVM)

Work Schedule of 1:25,000 Scale Digital Mapping

Prepared on 31 July 2013

Number of Months			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Year			2011												2012																														
Month			2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
North																																													
1	878	878																																											
2	1,007	1,885																																											
3	1,099	2,984																																											
4	580	3,564																																											
5	275	3,839																																											
6	1,368	5,207																																											
7	855	**6,062**																																											
South																																												
8	1011	7,073																																											
9	1071	8,144																																											
10	1005	9,149																																											
11	1032	10,181																																											
12	731	10,912																																											
13	607	**11,519**																																											
Major 5 cities																																												
Sylhet	80	80																																											
Rajshahi	79	159																																											
Barisal	77	236																																											
Khulna	142	378																																											
Chitagong	238	**616**																																											
Total	**12,135**																																											

Red Completed Blue Under going Black Plan 6094 10,600 60.6
4,506

Schedule and volume of digital plotting Scale 1:25,000 by photos and satellite Target area 144,000 km2 by photos and satellite

No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Year			2011												2012																																						
Month			3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Group	Km2/day					1.50							1.80							2.00						2.00						2.20						2.20						2.40						2.40					
Group-1	12	person						360	360	360	360	360	432	432	432	432	432	432	480	480	480	480	480	480	480	480	480	480	480	480	528	528	528	528	528	528	528	528	528	528	528	528	576	576	576	576	576	576	576	576	576	576	576	576	600	600
Group-2	12	person						360	360	360	360	360	432	432	432	432	432	432	480	480	480	480	480	480	480	480	480	480	480	480	528	528	528	528	528	528	528	528	528	528	528	528	576	576	576	576	576	576	576	576	576	576	576	576	600	600
Group-3	12	person						360	360	360	360	360	432	432	432	432	432	432	480	480	480	480	480	480	480	480	480	480	480	480	528	528	528	528	528	528	528	528	528	528	528	528	576	576	576	576	576	576	576	576	576	576	576	576	600	600
Total area		Plan km2						1,080	1,080	1,080	1,080	1,080	1,296	1,296	1,296	1,296	1,296	1,296	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,728	1,800	1,800
Accumulated area		Plan km2						1,080	2,160	3,240	4,320	5,400	6,696	7,992	9,288	10,584	11,880	13,176	14,616	16,056	17,496	18,936	20,376	21,816	23,256	24,696	26,136	27,576	29,016	30,456	32,040	33,624	35,208	36,792	38,376	39,960	41,544	43,128	44,712	46,296	47,880	49,464	51,192	52,920	54,648	56,376	58,104	59,832	61,560	63,288	65,016	66,744	68,472	70,200	72,000	73,800
Number of sheet		Plan Sheet						6	12	19	25	31	38	46	53	60	68	75	84	92	100	108	116	125	133	141	149	158	166	174	183	192	201	210	219	228	237	246	255	265	274	283	293	302	312	322	332	342	352	362	372	381	391	401	411	422
Monthly products		Actual Sheet						4.8	5.5	5.9	5.9	2.0	2.0	5.1	5.1	5.2	5.2	5.2	3.3	3.3	3.4	8.2	10.1	6.5	6.3	12.2	11.2	11.3	6.2	16.0	16.0																											
Accumulated sheets		Actual Sheet						4.8	10.3	16.2	22.1	24.1	26.1	31.2	36.3	41.5	46.7	51.9	55.2	58.5	61.9	70.1	80.2	86.7	93.0	105.2	116.4	127.7	133.9	149.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9
Schedule performance index								0.78	0.83	0.88	0.90	0.78	0.68	0.68	0.68	0.69	0.69	0.69	0.66	0.64	0.62	0.65	0.69	0.70	0.70	0.75	0.78	0.81	0.81	0.86	0.91	0.86	0.82	0.79	0.76	0.73	0.70	0.67	0.65	0.63	0.61	0.59	0.57	0.55	0.53	0.51	0.50	0.49	0.47	0.46	0.45	0.43	0.42	0.41	0.40	0.39
		Check Point						4.8	10.3		22.1		26.1					51.9				70.1	80.2		93.0	105.2		127.7	133.9		165.9																											

Working day per month
20 days
Overtime 0 hour 1 sheet 175.0 Km2

Schedule and volume of data correction and field identification Scale 1:25,000 Target area 144,000 km2

No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Year			2011												2012																																						
Month			2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Sheet/Month/Person									0.33						0.33								0.33						0.40						0.40						0.50						0.50						
Availabiliry of field work		Party-1												1	1	1	1	1						1	1	1	1	1						1	1	1								1	1	1										
Availabiliry of field work		Party-2												1	1	1	1	1						1	1	1	1	1						1	1	1								1	1	1										
Availabiliry of field work		Party-3																						1	1	1	1	1																											
Party-1	15	person						5.0	5.0	0.0	5.0	5.0	0.0	0.0	0.0	0.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	6.0	6.0	6.0	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0
Party-2	15	person						5.0	5.0	5.0	5.0	5.0	0.0	0.0	0.0	0.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	6.0	6.0	6.0	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0
Party-3	15	person						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	6.0	6.0	6.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0
Total sheet		Sheet						10	10	5	10	10	0	0	0	0	10	10	15	18	18	18	18	18	0	0	0	0	12	12	12	15	15	15	23	23	0	0	0	0	15	15	15	15	15	23	23	23	0	0	0	15	15	15	15	15	23	23	23	0	0	0
Accumulated sheet		Sheet						10	20	25	35	45	45	45	45	45	45	45	54	64	79	97	115	133	151	169	169	169	169	181	193	205	220	235	250	273	295	295	295	295	310	325	340	355	370	393	415	438	438	438	438	438	438	438
Accumulated area		Km2						1,733	3,465	4,331	6,064	7,796	7,796	7,796	7,796	7,796	7,796	7,796	9,529	11,261	13,860	17,010	20,160	23,310	26,460	29,610	29,610	29,610	31,710	33,810	35,910	38,535	41,160	43,785	47,723	51,660	51,660	51,660	51,660	54,285	56,910	59,535	62,160	64,785	68,723	72,660	76,598	76,598	76,598	76,598	76,598	76,598	76,598	76,598
Monthly products		Actual Sheet						5.0	5.0	5.0	5.0	5.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Accumulated sheets		Actual Sheet						5.0	10.0	15.0	20.0	25.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0
Schedule performance index								0.51	0.51	0.61	0.58	0.56	0.70	0.70	0.70	0.70	0.57	0.48	0.39	0.32	0.27	0.23	0.21	0.18	0.18	0.18	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
		Check Point																																																					

Working day per month
20 days
Overtime 0 hour 1 sheet 175.0 Km2

Schedule and volume of data input, classification and structuring Scale 1:25,000 Target area 144,000 km2

No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Year			2011												2012																																						
Month			2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Sheet/Month/Person									0.66						0.66								0.66						0.66						0.70						0.80														
Availabiliry of work		Party-1												1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Availabiliry of work		Party-2																						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Availabiliry of work		Party-3																																																						
Party-1	5	person												3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Party-2	5	person												0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Party-3	5	person												0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total sheet		Sheet												3	3	3	3	3	3	3	3	3	3	10	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12
Accumulated sheet		Sheet												3	6	9	12	15	18	21	24	27	30	40	50	60	70	80	90	100	110	120	130	141	152	163	174	185	196	207	218	229	240	251	263	275	287	299	311	323	335	347
Accumulated area		Km2												578	1,155	1,733	2,310	2,888	3,465	4,043	4,620	5,198	5,775	6,930	8,085	9,240	10,395	11,550	12,705	13,860	15,015	16,170	17,325	18,480	19,635	20,790	21,945	23,100	24,255	25,410	26,565	27,720	28,875	30,030	31,185	32,340	33,495	34,650	35,805	36,960	38,115	39,270	40,425	41,580
Monthly products		Actual Sheet												0.0	3.0	3.0	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Accumulated sheets		Actual Sheet												0.0	3.0	6.0	9.0	12.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Schedule performance index														0.00	0.45	0.61	0.68	0.73	0.76	0.65	0.57	0.51	0.45	0.35	0.28	0.24	0.21	0.18	0.16	0.15	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
		Check Point																																																					

Working day per month
20 days
Overtime 0 hour 1 sheet 175.0 Km2

Schedule and volume of cartography Scale 1:25,000 Target area 144,000 km2

No.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Year			2011												2012																																						
Month			2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Sheet/Month/Person									0.66						0.66								0.66						0.66						0.66						0.66														
Availabiliry of work		Party-1													1	1	1																																						
Availabiliry of work		Party-2																																																				
Availabiliry of work		Party-3																																																				
Party-1	5	person												3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Party-2	6	person												0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Party-3	7	person												0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Total sheet		Sheet												3	3	3	3	3	3	3	3	3	3	7	7	7	7	7	7	7	7	7	7	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Accumulated sheet		Sheet												3	7	10	13	17	20	23	26	30	33	36	40	43	50	57	65	77	88	100	112	124	136	148	160	167	174	182	193	205	217	229	241	253	265	277	288	300	312	324	336	348
Accumulated area		Km2												578	1,155	1,733	2,310	2,888	3,465	4,043	4,620	5,198	5,775	6,353	6,930	7,508	8,778	10,049	11,319	13,398	15,477	17,556	19,635	21,714	23,793	25,872	27,951	29,222	30,492	31,763	33,842	35,921	38,000	40,079	42,158	44,237	46,316	48,395	50,474	52,553	54,632	56,711	58,790	60,869
Monthly products		Actual Sheet												0.0	0.0	0.0	3.9	0.9	8.0	8.7	6.6	0.3	0.3	1.7	1.7	1.8	1.0	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Accumulated sheets		Actual Sheet												0.0	0.0	0.0	3.9	4.8	12.8	21.5	28.1	28.4	28.7	30.4	32.1	33.9	34.9	38.4	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
Schedule performance index														0.00	0.00	0.00	0.30	0.29	0.65	0.93	1.06	0.96	0.87	0.84	0.81	0.79	0.70	0.67	0.65	0.55	0.47	0.42	0.37	0.34	0.31	0.28	0.26	0.25	0.24	0.23	0.22	0.20	0.19	0.18	0.17	0.17	0.16	0.15	0.15	0.14	0.13	0.13	0.12	0.12
		Check Point															3.9	4.8		21.5	28.1		28.7			33.9	34.9		41.9																											

Working day per month
20 days
Overtime 0 hour 1 sheet 175.0 Km2

52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
										2016												2017												2018					
9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	2.50						2.50						2.50						2.50						2.50						2.50						2.50		
600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
75,600	77,400	79,200	81,000	82,800	84,600	86,400	88,200	90,000	91,800	93,600	95,400	97,200	99,000	100,800	102,600	104,400	106,200	108,000	109,800	111,600	113,400	115,200	117,000	118,800	120,600	122,400	124,200	126,000	127,800	129,600	131,400	133,200	135,000	136,800	138,600	140,400	142,200	144,000	145,800
432	442	453	463	473	483	494	504	514	525	535	545	555	566	576	586	597	607	617	627	638	648	658	669	679	689	699	710	720	730	741	751	761	771	782	792	802	813	823	833
165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9
0.38	0.38	0.37	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20

52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
										2016												2017												2018												2019					
9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
										0.50												0.50												0.50												0.50					
	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1
	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1
					1	1	1	1									1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1
0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5
0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5
0.0	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	0.0	0.0	0.0	0.0	7.5	7.5	7.5
0	15	15	15	15	23	23	23	23	0	0	0	0	15	15	15	15	23	23	23	23	0	0	0	0	23	23	23	23	23	23	23	23	0	0	0	0	23	23	23	23	23	23	23	23	0	0	0	0	23	23	23
438	453	468	483	498	520	543	565	588	588	588	588	588	603	618	633	648	670	693	715	738	738	738	738	738	760	783	805	828	850	873	895	918	918	918	918	918	940	963	985	1,008	1,030	1,053	1,075	1,098	1,098	1,098	1,098	1,098	1,120	1,143	1,165
76,598	79,223	81,848	84,473	87,098	91,035	94,973	98,910	102,848	102,848	102,848	102,848	102,848	105,473	108,098	110,723	113,348	117,285	121,223	125,160	129,098	129,098	129,098	129,098	129,098	133,035	136,973	140,910	144,848	148,785	152,723	156,660	160,598	160,598	160,598	160,598	160,598	164,535	168,473	172,410	176,348	180,285	184,223	188,160	192,098	192,098	192,098	192,098	192,098	196,035	199,973	203,910
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0
0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
										2016												2017												2018												2019					
9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
										0.90												0.90												0.90												1.00					
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4.0	4.0	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4.0	4.0	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
4.0	4.0	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
12	12	12	12	14	14	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	15	15	15	15	15
406	418	430	442	455	469	482	496	509	523	536	550	563	572	581	590	599	608	617	626	640	653	667	680	694	707	721	734	748	761	775	788	802	815	829	842	856	869	883	896	911	926	941	956	971	986	1,001	1,016	1,031	1,046	1,061	1,076
70,980	73,080	75,180	77,280	79,643	82,005	84,368	86,730	89,093	91,455	93,818	96,180	98,543	100,118	101,693	103,268	104,843	106,418	107,993	109,568	111,930	114,293	116,655	119,018	121,380	123,743	126,105	128,468	130,830	133,193	135,555	137,918	140,280	142,643	145,005	147,368	149,730	152,093	154,455	156,818	159,443	162,068	164,693	167,318	169,943	172,568	175,193	177,818	180,443	183,068	185,693	188,318
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01

52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
										2016												2017												2018												2019					
9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
										0.66												0.66												0.66												0.66					
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
360	372	383	395	407	419	431	443	455	467	479	490	502	514	526	538	550	562	574	585	597	609	621	633	645	657	669	680	692	704	716	728	740	752	764	776	787	799	811	823	835	847	859	871	882	894	906	918	930	942	954	966
62,948	65,027	67,106	69,185	71,264	73,343	75,422	77,501	79,580	81,659	83,738	85,817	87,896	89,975	92,054	94,133	96,212	98,291	100,370	102,449	104,528	106,607	108,686	110,765	112,844	114,923	117,002	119,081	121,160	123,239	125,318	127,397	129,476	131,555	133,634	135,713	137,792	139,871	141,950	144,029	146,108	148,187	150,266	152,345	154,424	156,503	158,582	160,661	162,740	164,819	166,898	168,977
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04