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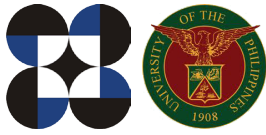
Agno River Flood Plain:

DREAM LiDAR Data Acquisition
and Processing Report



TRAINING CENTER FOR APPLIED GEODESY AND PHOTOGRAMMETRY

2015



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For questions/queries regarding this report, contact:

Engr. Czar Jakiri S. Sarmiento, MSRS

Project Leader, Data Acquisition Component, DREAM Program
University of the Philippines Diliman
Quezon City, Philippines 1101
Email: czarjakiri@gmail.com

Engr. Ma. Rosario Concepcion O. Ang, MSRS

Project Leader, Data Processing Component, DREAM Program
University of the Philippines Diliman
Quezon City, Philippines 1101
Email: concon.ang@gmail.com

Enrico C. Paringit, Dr. Eng.

Program Leader, DREAM Program
University of the Philippines Diliman
Quezon City, Philippines 1101
Email: paringit@gmail.com

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Table of Contents

1.	INTRODUCTION	1
1.1	About the DREAM Program	2
1.2	Objective and Target Outputs	2
1.3	General Methodological Framework	3
2.	STUDY AREA	5
3.	METHODOLOGY	9
3.1	Acquisition Methodology	10
3.1.1	Pre-site Preparations	10
3.1.1.1	Creation of Flight Plans	10
3.1.1.2	Collection of Existing Ref. Points and Benchmarks	12
3.1.1.3	Preparation of Field Plan	12
3.1.2	Ground Base Set-up	13
3.1.3	Acquisition of Digital Elevation Data (LiDAR Survey)	13
3.1.4	Transmittal of Acquired LiDAR Data	13
3.1.5	Equipment (ALTM Pegasus)	14
3.2	Processing Methodology	15
3.2.1	Data Transfer	15
3.2.2	Trajectory Computation	16
3.2.3	LiDAR Point Cloud Rectification	16
3.2.4	LiDAR Data Quality Checking	17
3.2.5	LiDAR Point Cloud Classification and Rasterization	20
3.2.6	DEM Editing and Hydro-correction	23
4.	RESULTS AND DISCUSSION	25
4.1	LiDAR ACQUISITION IN AGNO FLOODPLAIN	26
4.1.1	Flight Plans	26
4.1.2	Ground Base Station	28
4.2	LiDAR DATA PROCESSING	37
4.2.1	Trajectory Computation	37
4.2.2	LiDAR point cloud computation	39
4.2.3	LiDAR Data Quality Checking	39
4.2.4	LiDAR Point Cloud Classification and Rasterization	42
4.2.5	DEM Editing and Hydro-correction	44
5.	ANNEX	49
	ANNEX A. Optech Technical Specifications of the Pegasus Sensor	50
	ANNEX B. Optech Technical Specifications of the D-8900	51
	ANNEX C. The Survey Team	52
	ANNEX D. NAMRIA Certification	53
	ANNEX E. Data Transfer Sheet for Agno Floodplain	56
	ANNEX F. Flight logs for Agno Floodplain	66



List of Figures

Figure 1.	General Methodological Framework of the Program	3
Figure 2.	Agno River Basin Location Map	6
Figure 3.	Agno River Basin Soil Map	7
Figure 4.	Agno River Basin Land Cover Map	7
Figure 5.	Flowchart of Project Methodology	10
Figure 6.	Concept of LiDAR Data Acquisition Parameters	11
Figure 7.	LiDAR Data Management for Transmittal	14
Figure 8.	The ALTM Pegasus Systems	14
Figure 9.	Schematic Diagram of the Data Processing	15
Figure 10.	Misalignment of a Single Roof Plane from Two Adjacent Flight Lines, Before Rectification	17
Figure 11.	Elevation Difference Between Flight Lines Generated from LAStools	18
Figure 12.	Profile Over Roof Planes	19
Figure 13.	Ground Classification Technique Employed in Terrascan	20
Figure 14.	Resulting DTM of Ground Classification Using the Default Parameters	21
Figure 15.	Default Terrascan Building Classification Parameters	22
Figure 16.	Different Examples of Air Points Manually Deleted in the TerraScan Window	22
Figure 17.	Agno Floodplain Flight Plans	27
Figure 18.	PNG-50 Located in the Town Plaza fronting Sto.Tomas Municipal Hall in Pangasinan	30
Figure 19.	Agno Floodplain Flight Plans and Base Station	31
Figure 20.	Agno Floodplain Data Acquisition LAS Output	32
Figure 21.	Smoothed Performance Metric Parameters of Agno Flight	37
Figure 22.	Solution Status Parameters of Agno Flight	38
Figure 23.	Coverage of LiDAR Data for the Agno Mission	39
Figure 24.	Image of Data Overlap for the Agno Mission	40
Figure 25.	Density Map of Merged LiDAR Data for the Agno Mission	40
Figure 26.	Elevation Difference Map between Flight Lines	41
Figure 27.	Quality Checking with the Profile Tool of QT Master	42
Figure 28.	Agno Floodplains and Agno Classification Results in TerraScan	43
Figure 29.	Point Cloud Before and After Classification	43
Figure 30.	Images of DTMs Before and After Manual Editing	44
Figure 31.	Map of Agno River System with Validation Survey Shown in Blue	45
Figure 32.	One-one Correlation Plot Between topographic and LiDAR Data	45
Figure 33.	Final DTM of Agno with Validation Survey Shown in Blue	46
Figure 34.	Final DSM in Agno	47
Figure 35.	Sample 1x1 Square Kilometer DSM	47
Figure 36.	Sample 1x1 Square Kilometer DTM	48
Figure 37.	Sample 1x1 Kilometer Orthophoto	48



List of Tables

Table 1.	Relevant LiDAR Parameters	11
Table 2.	List of Target River Systems in the Philippines	12
Table 3.	Smoothed Solution Status Parameters in POSPAC MMS v6.2	16
Table 4.	Parameters Investigated During Quality Checks	18
Table 5.	Ground Classification Parameters Used in Terrascan for Floodplain and Watershed Areas	20
Table 6.	Classification of Vegetation According to the Elevation Points	21
Table 7.	Parameters Used in LiDAR System During Flight Acquisition	26
Table 8.	Details of DVS-1 GPS Used as a Base Station for the LiDAR Acquisition	28
Table 9.	Details of the Recovered NAMRIA Horizontal Control Point PNG-56 used as Base Station for the LiDAR Acquisition	28
Table 10.	Details of the Recovered NAMRIA Horizontal Control Point PNG-3235 used as Base Station for the LiDAR Acquisition	29
Table 11.	Details of Established Ground Control Points by Data Acquisition Component for LiDAR Survey in Agno Floodplain	29
Table 12.	Flight Missions for LiDAR Data Acquisition in Agno Floodplains	33
Table 13.	Area of Coverage of the LiDAR Data Acquisition in Davao Floodplain	34
Table 14.	Agno Classification Results in TerraScan	43
Table 15.	Statistical Values for the Calibration of Flights	46



Abbreviations

ALTM	Airborne Laser Terrain Mapper
DAC	Data Acquisition Component
DEM	Digital Elevation Model
DSM	Digital Surface Model
DTM	Digital Terrain Model
DVC	Data Validation Component
FOV	Field of View
FTP	File Transfer Protocol
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
POS	Position Orientation System
PRF	Pulse Repetition Frequency
NAMRIA	National Mapping and Resource Information Authority





Introduction

Introduction

1.1 About the DREAM Program

The UP Training Center for Applied Geodesy and Photogrammetry (UP TCAGP) conducts a research program entitled “Nationwide Disaster Risk and Exposure Assessment for Mitigation (DREAM) Program” funded by the Department of Science and Technology (DOST) Grants-in-Aid Program. The DREAM Program aims to produce detailed, up-to-date, national elevation dataset for 3D flood and hazard mapping to address disaster risk reduction and mitigation in the country.

The DREAM Program consists of four components that operationalize the various stages of implementation. The Data Acquisition Component (DAC) conducts aerial surveys to collect Light Detecting and Ranging (LiDAR) data and aerial images in major river basins and priority areas. The Data Validation Component (DVC) implements ground surveys to validate acquired LiDAR data, along with bathymetric measurements to gather river discharge data. The Data Processing Component (DPC) processes and compiles all data generated by the DAC and DVC. Finally, the Flood Modeling Component (FMC) utilizes compiled data for flood modeling and simulation.

Overall, the target output is a national elevation dataset suitable for 1:5000 scale mapping, with 50 centimeter horizontal and vertical accuracies. These accuracies are achieved through the use of state-of-the-art airborne Light Detection and Ranging (LiDAR) technology and appended with Synthetic-aperture radar (SAR) in some areas. It collects point cloud data at a rate of 100,000 to 500,000 points per second, and is capable of collecting elevation data at a rate of 300 to 400 square kilometers per day, per sensor.

1.2 Objectives and Target Outputs

The program aims to achieve the following objectives:

- a) To acquire a national elevation and resource dataset at sufficient resolution to produce information necessary to support the different phases of disaster management;
- b) To operationalize the development of flood hazard models that would produce updated and detailed flood hazard maps for the major river systems in the country;
- c) To develop the capacity to process, produce and analyze various proven and potential thematic map layers from the 3D data useful for government agencies;
- d) To transfer product development technologies to government agencies with geospatial information requirements, and;
- e) To generate the following outputs
 - 1) flood hazard map
 - 2) digital surface model
 - 3) digital terrain model and
 - 4) orthophotograph



Introduction

1.3 General Methodological Framework

The methodology employed to accomplish the project’s expected outputs are subdivided into four (4) major components, as shown in Figure 1. Each component is described in detail in the following sections.

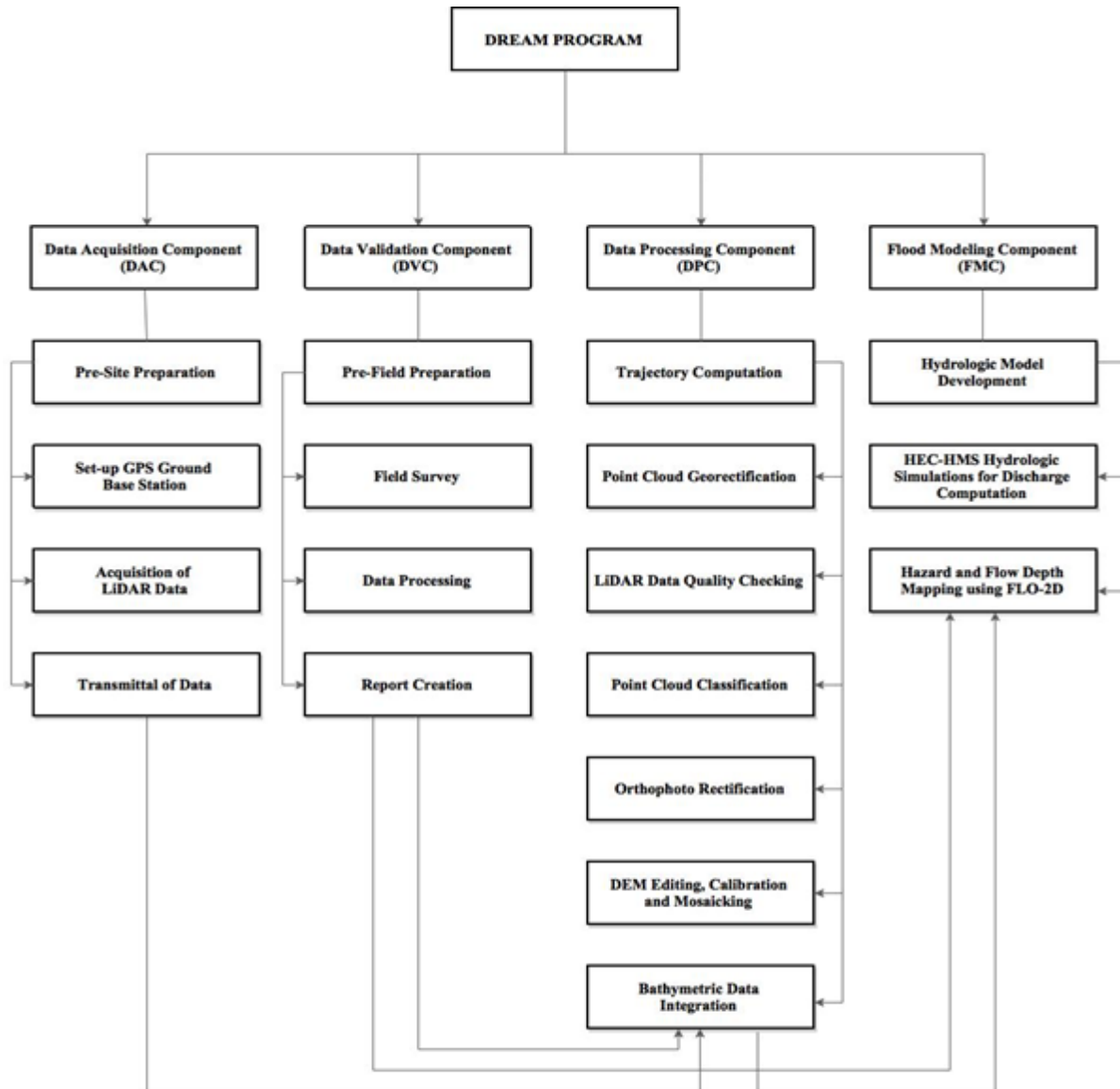


Figure 1. The General Methodological Framework of the Program





Study Area

Study Area

The Agno River Basin is situated in Luzon and is the fifth largest river basin in the Philippines, with an estimated basin area of 5,852 square kilometers. The Agno River is also considered as the third largest in Luzon, with its river system having a length of 270 kilometers, 90 kilometers of which runs through mountainous terrain and canyons. The location of the Agno River Basin is as shown in Figure 2.

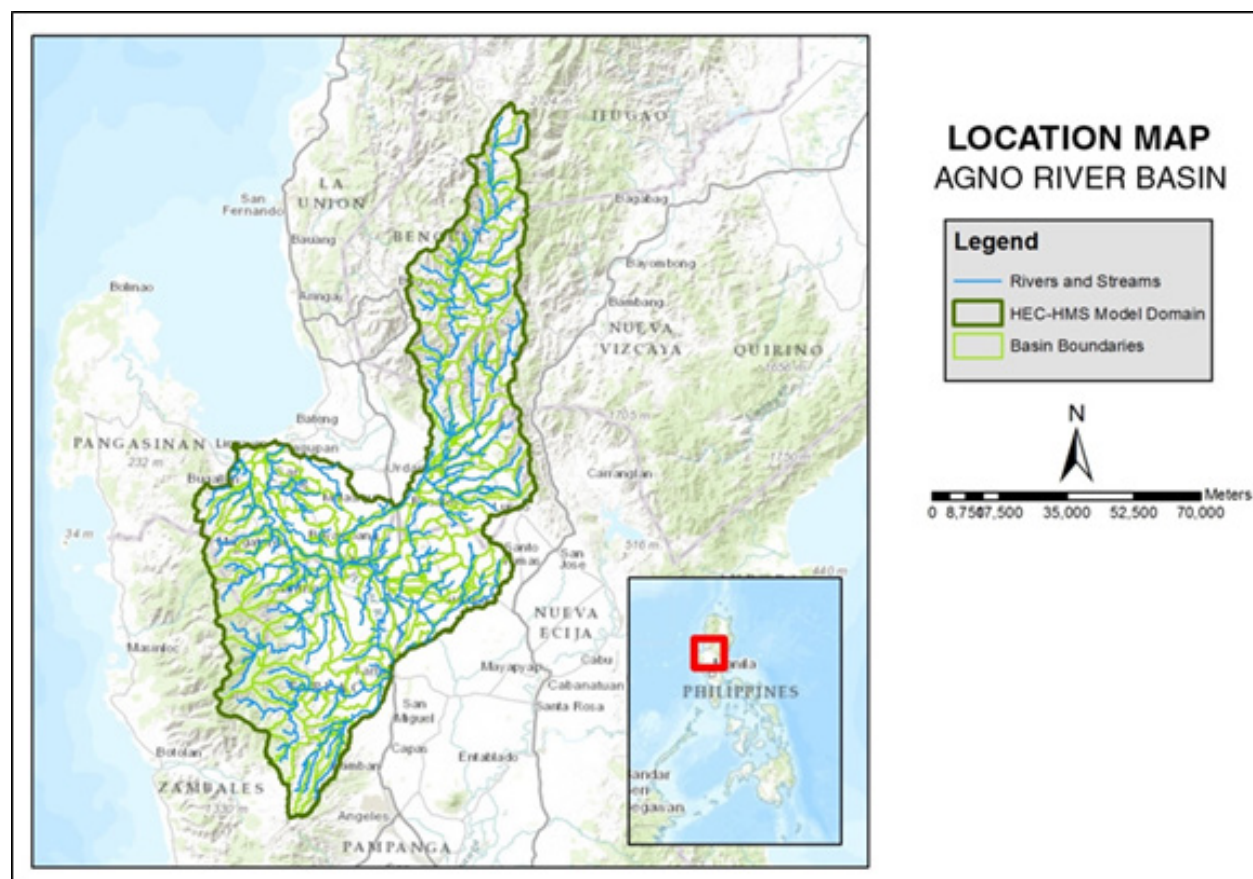


Figure 2. Agno River Basin Location Map

The headwaters of the Agno River are at the Cordillera Mountains and drains about 6.6 cubic kilometres of fresh water into the Lingayen Gulf in Pangasinan, becoming the largest Philippine river in terms of water discharge. It has 4 principal tributaries-- Tarlac River, which is the main branch, the Pila River, the Camiling River, and the Ambayoan River. It drains the western portion of the island and a large part of its catchment is located in Pangasinan. According to the Agno River Basin Development Commission (ARBDC), the river basin covers 68 municipalities and 5 cities in the provinces of Benguet, Tarlac and Pangasinan.

The land and soil characteristics are important parameters used in assigning the roughness coefficient for different areas within the river basin. The roughness coefficient, also called Manning's coefficient, represents the variable flow of water in different land covers (i.e. rougher, restricted flow within vegetated areas, smoother flow within channels and fluvial environments).

The shape files of the soil and land cover were taken from the Bureau of Soils, which is under the Department of Environment and Natural Resources Management, and National Mapping

Study Area

and Resource Information Authority (NAMRIA). The soil and land cover of Agno River Basin are shown in Figure 3 and Figure 4, respectively.

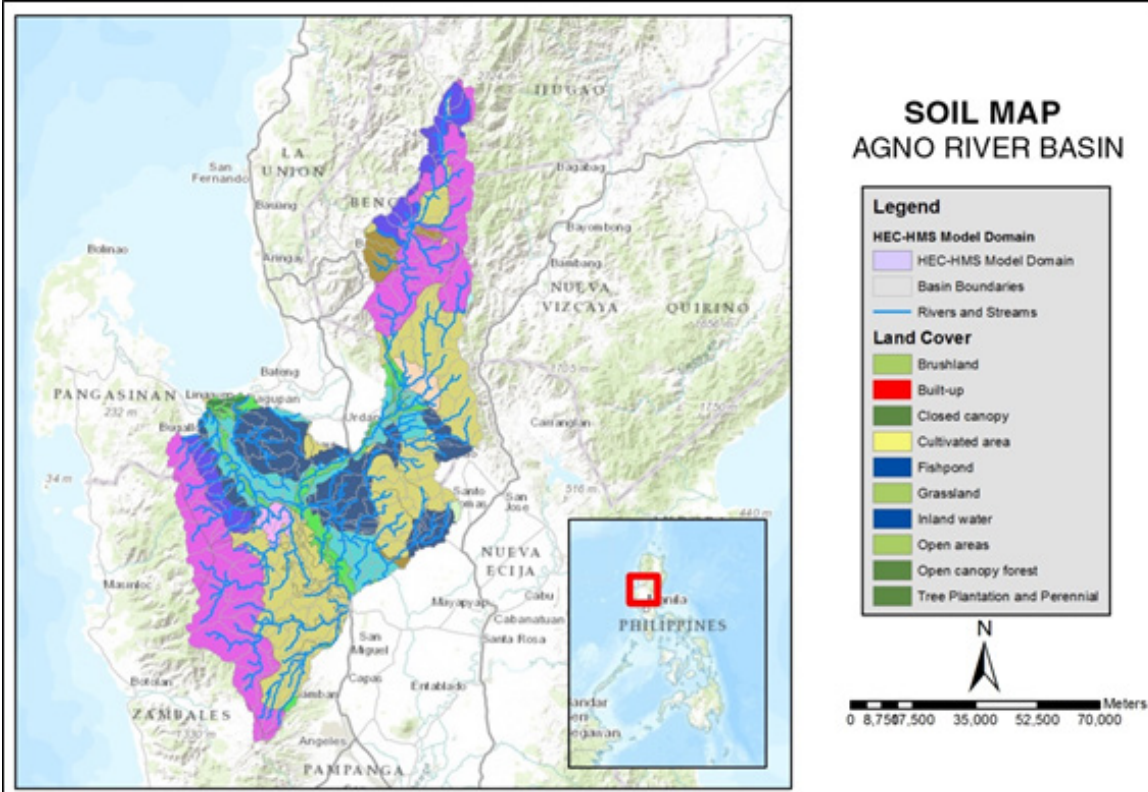


Figure 3. Agno River Basin Soil Map

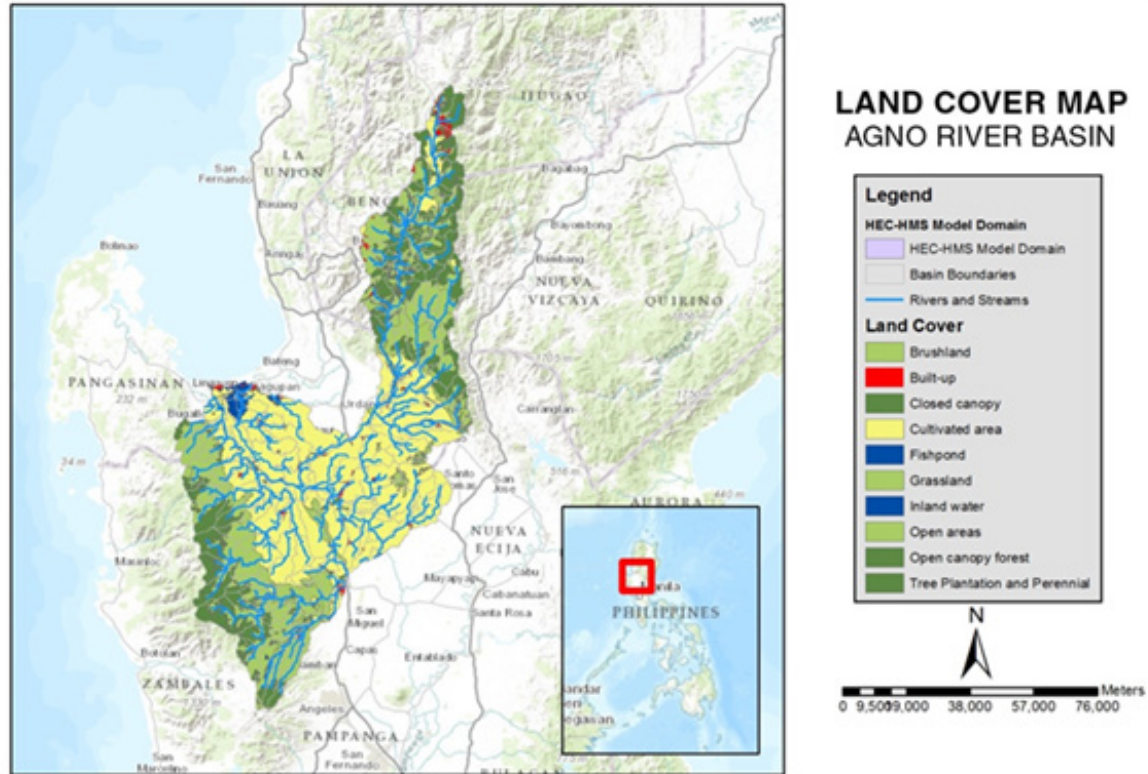


Figure 4. Agno River Basin Land Cover Map





Methodology

Methodology

3.1 Acquisition Methodology

The methodology employed to accomplish the project’s expected outputs are subdivided into four (4) major components, as shown in Figure 5. Each component is described in detail in the following sections.

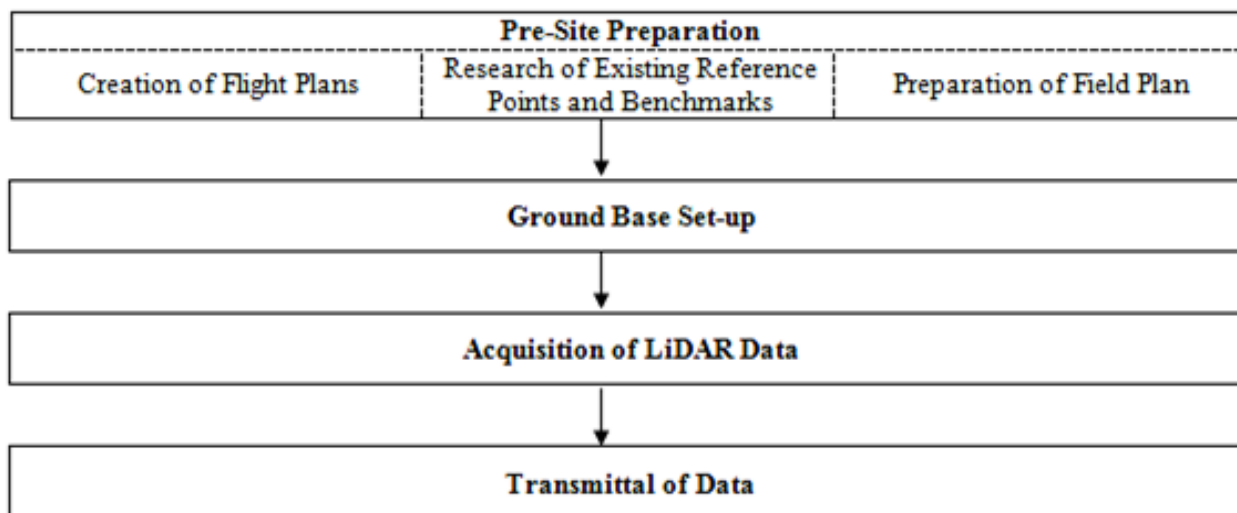


Figure 5. Flowchart of project methodology

3.1.1 Pre-Site Preparations

3.1.1.1 Creation of Flight Plans

Flight planning is the process of configuring the parameters of the aircraft and LiDAR technology (i.e., altitude, angular field of view (FOV)), speed of the aircraft, scans frequency and pulse repetition frequency) to achieve a target of two points per square meter point density for the floodplain. This ensures that areas of the floodplain that are most susceptible to floods will be covered. LiDAR parameters and their computations are shown in Table 1.

The parameters set in the LiDAR sensor to optimize the area coverage following the objectives of the project and to ensure the aircraft’s safe return to the airport (base of operations) are shown in Table 1. Each flight acquisition is designed for four operational hours. The maximum flying hours for Cessna 206H is five hours.

Methodology

Table 1. Relevant LiDAR parameters

Parameter	Formula	Description
SW (Swath Width)	$SW = 2 * H * \tan(\theta/2)$	H – altitude θ – angular FOV
Point Spacing	$\Delta X_{\text{across}} = (\theta * H) / (N \cos^2(\theta/2))$	ΔX_{across} – point spacing across the flight line H – altitude θ – angular FOV N – number of points in one scanning line
	$\Delta X_{\text{along}} = v / f_{\text{sc}}$	ΔX_{along} – point spacing along the flight line v – forward speed (m/s) f_{sc} – scanning rate or scan frequency
Point density, d_{min}	$d_{\text{min}} = 1 / (\Delta X_{\text{across}} * \Delta X_{\text{along}})$	ΔX_{across} , ΔX_{along} point spacings
Flight line separation, e	$e = SW * (1 - \text{overlapping factor})$	SW – swath width
# of flight lines, n	$n = w / [(1 - \text{overlap}) * SW]$	w – width of the map that will be produce in meters. The direction of flights will be perpendicular to the width.

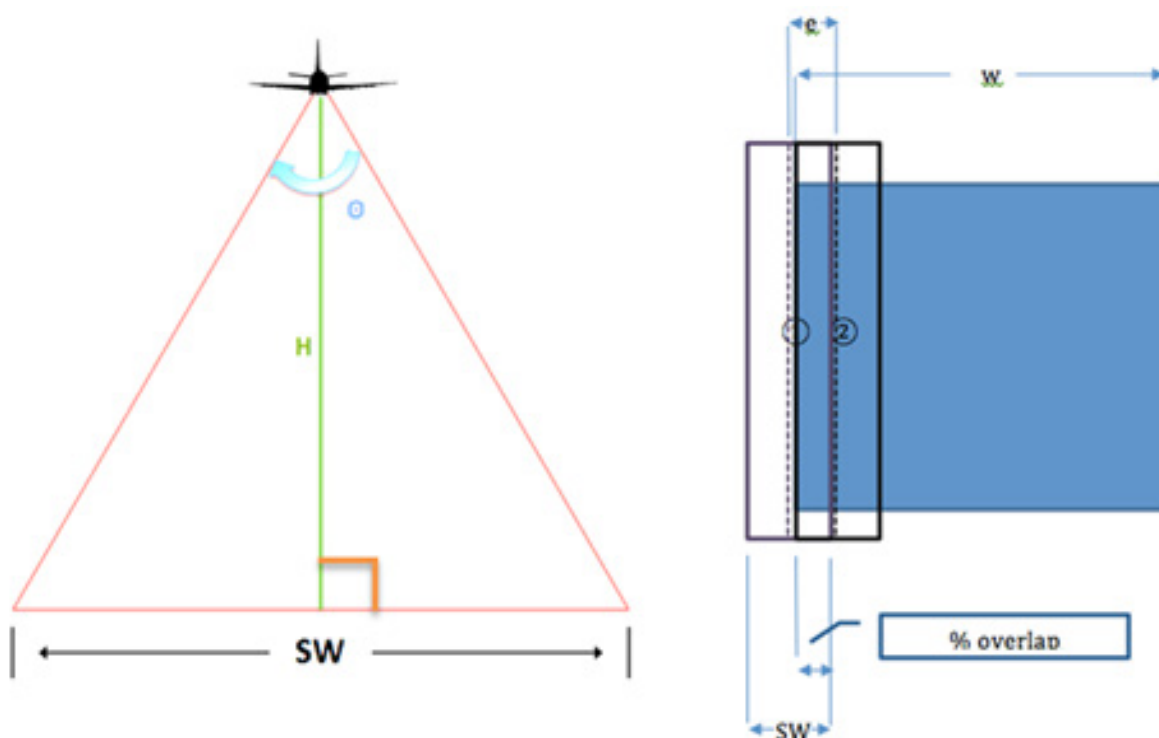


Figure 6. Concept of LiDAR data acquisition parameters

Methodology

The relationship among altitude, swath, and FOV is shown in Figure 6. Given the altitude of the survey (H) and the angular FOV, the survey coverage for each pass (swath) can be calculated by doubling the product of altitude and tangent of half the field of view.

3.1.1.2 Collection of Existing Reference Points and Benchmarks

Collection of pertinent technical data, available information, and coordination with the National Mapping and Resource Information Authority (NAMRIA) is conducted prior to the surveys. Reference data collected includes locations and descriptions of horizontal and vertical control (elevation benchmarks) points within or near the project area. These control points are used as base stations for the aerial survey operations. Base stations are observed simultaneously with the acquisition flights.

3.1.1.3 Preparation of Field Plan

In preparation for the field reconnaissance and actual LiDAR data acquisition, a field plan is prepared by the implementation team. The field plan serves as a guide for the actual fieldwork and included personnel, logistical, financial, and technical details. Three major factors are included in field plan preparation: priority areas for the major river basin system; budget; and accommodation and vehicle rental.

LiDAR data are acquired for the floodplain area of the river system as per order of priority based on history of flooding, loss of lives, and damages of property. The order of priority in which LiDAR data surveys are conducted by the team for the floodplain areas of the 18 major river systems and 3 additional systems is shown in Table 2.

Table 2. List of Target River Systems in the Philippines

	Target River System	Location	Area of the River System (km ²)	Area of the Flood Plain (km ²)	Area of the Watershed (km ²)
1	Cagayan de Oro	Mindanao	1,364	25	1,338.51
1.1	Iponan	Mindanao	438	33	404.65
2	Mandulog	Mindanao	714	7	707.41
2.1	Iligan	Mindanao	153	7	146.38
2.2	Agus	Mindanao	1,918	16	1,901.60
3	Pampanga	Luzon	11,160	4458	6702
4	Agno	Luzon	6,220	1725	4495
5	Bicol	Luzon	3,173	585	2,587.79
6	Panay	Visayas	2,442	619	1823
7	Jalaur	Visayas	2,105	713	1,392.00
8	Ilog Hilabangan	Visayas	2,146	179	1967
9	Magasawang Tubig	Luzon	1,960	483	1,477.08
10	Agusan	Mindanao	11,814	262	11,551.62



Methodology

11	Tagoloan	Mindanao	1,753	30	1,722.90
12	Davao	Mindanao	1,609	54	1555
13	Tagum	Mindanao	2,504	595	1,909.23
14	Buayan	Mindanao	1,589	201	1,388.21
15	Mindanao	Mindanao	20,963	405	20,557.53
16	Lucena	Luzon	238	49	189.31
17	Infanta	Luzon	1,029	90	938.61
18	Boracay	Visayas	43.34	43.34	n/a
19	Cagayan	Luzon	28,221	10386	17,835.14

3.1.2 Ground Base Set-up

A reconnaissance is conducted one day before the actual LiDAR survey for purposes of recovering control point monuments on the ground and site visits of the survey area set in the flight plan for the floodplain. Coordination meetings with the Airport Manager, regional DOST office, local government units and other concerned line government agencies are also held.

Ground base stations are established within 30-kilometer radius of the corresponding survey area in the flight plan. This enables the system to establish its position in three-dimensional (3D) space so that the acquired topographic data will have an accurate 3D position since the survey required simultaneous observation with a base station on the ground using terrestrial Global Navigation Satellite System (GNSS) receivers.

3.1.3 Acquisition of Digital Elevation Data (LiDAR Survey)

Acquisition of LiDAR data is done by following the flight plans. The survey uses a LiDAR instrument mounted on the aircraft with its sensor positioned through a specially modified peep hole on the belly of the aircraft. The pilots are guided by the flight guidance software which uses the data out of the flight planning program with a mini-display at the pilot's cockpit showing the aircraft's real-time position relative to the current survey flight line. The reference points established by NAMRIA are also monitored and used to calibrate the data.

As the system collected LiDAR data, ranges and intensities are recorded on hard drives dedicated to the system while the images are stored on the camera hard drive. Position Orientation System (POS) data is recorded on the POS computer inside the control rack. It can only be accessed and downloaded via file transfer protocol (ftp) to the laptop computer. GPS observations were downloaded each day for efficient data management.

3.1.4 Transmittal of Acquired LiDAR Data

All data surrendered are monitored, inspected and re-checked by securing a data transfer checklist signed by the downloader (Data Acquisition Component) and the receiver (Data Processing Component). The data transfer checklist shall include the following: date of survey, mission name, flight number, disk size of the necessary data (LAS, LOGS, POS, Images, Mission Log File, Range, Digitizer and the Base Station), and the data directory within the server.



Methodology

Figure 7 shows the arrangement of folders inside the data server.

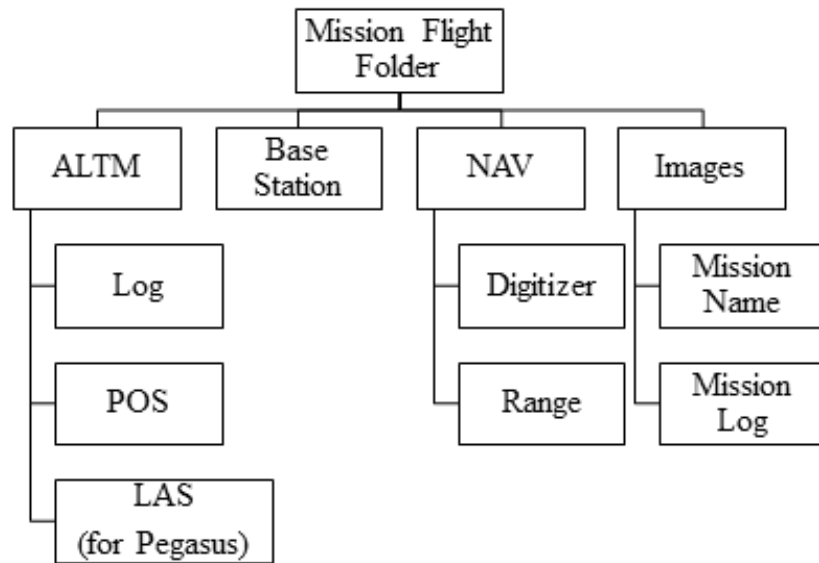


Figure 7. LiDAR Data Management for transmittal

3.1.5 Equipment (ALTM Pegasus)

The ALTM Pegasus (Optech, Inc) is a laser based system suitable for topographic survey (Figure 8). It has a dual output laser system for maximum density capability. The LiDAR system is equipped with an Inertial Measurement Unit (IMU) and GPS for geo-referencing of the acquired data (Annex A contains the technical specification of the system).

The camera of the Pegasus sensor is tightly integrated with the system. It has a footprint of 8,900 pixels across by 6,700 pixels along the flight line (Annex B contains the technical specification of the D-8900 aerial digital camera).

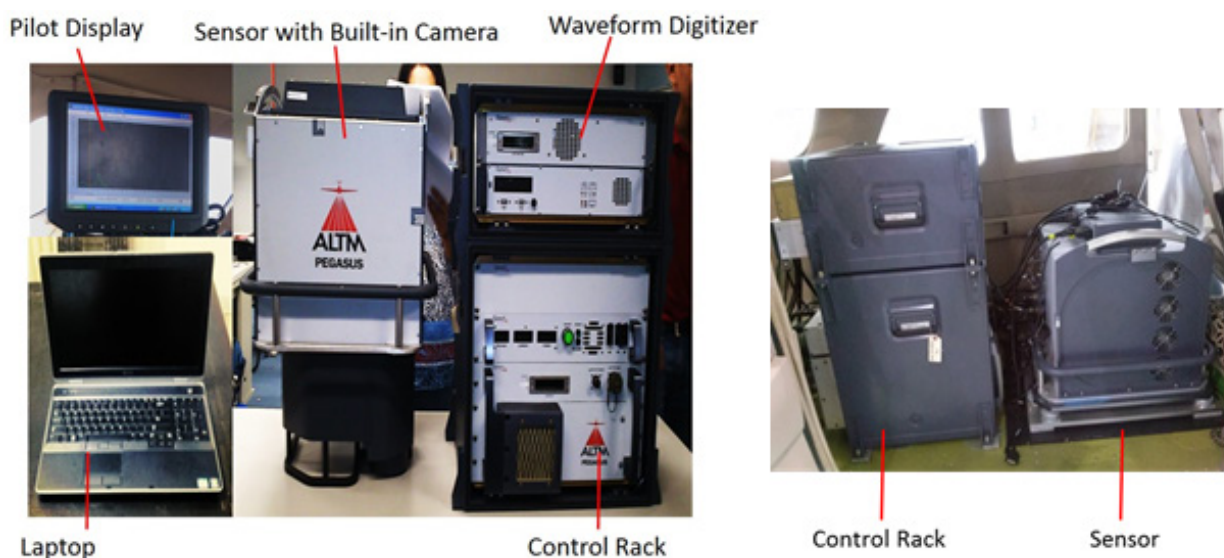


Figure 8. The ALTM Pegasus System: a) parts of the Pegasus system, b) the system as installed in Cessna T206H

Methodology

3.2 Processing Methodology

The schematic diagram of the workflow implemented by the Data Processing Component (DPC) is shown in Figure 9. The raw data collected by the Data Acquisition Component (DAC) is transferred to DPC. Pre-processing of this data starts with the computation of trajectory and georectification of point cloud, in which the coordinates of the LiDAR point cloud data are adjusted and checked for gaps and shifts, using POSpac, LMS, LAsTools and Quick Terrain (QT) Modeler software.

The unclassified LiDAR data then undergoes point cloud classification, which allows cleaning of noise data that are not necessary for further processing, using TerraScan software. The classified point cloud data in ASCII format is used to generate a data elevation model (DEM), which is edited and calibrated with the use of validation and bathymetric survey data collected from the field by the Data Validation and Bathymetry Component (DVBC). The final DEM is then used by the Flood Modeling Component (FMC) to generate the flood models for different flooding scenarios.

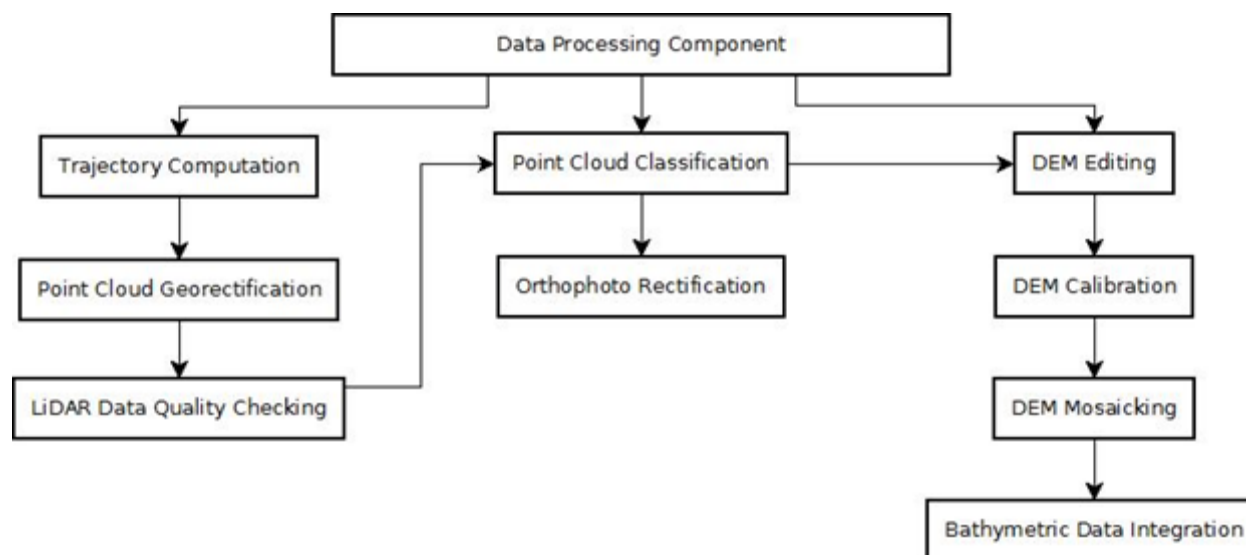


Figure 9. Schematic diagram of the data processing

3.2.1 Data Transfer

The mission is named 1AGN5M036A, which was flown with the Airborne LiDAR Terrain Mapper (ALTM™ Optech Inc.) Pegasus system on February 5, 2013. The Data Acquisition Component (DAC) transferred 16.1 Gigabytes of range data, 126 Megabytes of POS data, 11.3 Megabytes of GPS base station data, and 28 Gigabytes of raw image data to the data server. DPC verified the completeness of the transferred data. The whole Agno dataset was fully transferred on February 11, 2013.

Methodology

3.2.2 Trajectory Computation

The trajectory of the aircraft is computed using the software POSPAC MMS v6.2. It combines the POS data from the integrated GPS/INS system installed on the aircraft, and the Rinex data from the GPS base station located within 25 kilometers of the area. It then computes the Smoothed Best Estimated Trajectory (SBET) file, which contains the best estimated trajectory of the aircraft, and the Smoothed Root Mean Square Estimation error file (SMRMSG), which contains the corresponding standard deviations of the position parameters of the aircraft at every point on the computed trajectory.

The key parameters checked to evaluate the performance of the trajectory are the Solution Status parameters and the Smoothed Performance Metrics parameters. The Solution Status parameters characterize the GPS satellite geometry and baseline length at the time of acquisition, and the processing mode used by POSPAC. The acceptable values for each Solution Status parameter are shown in Table 3.

The Smoothed Performance Metrics parameters describe the root mean square error (RMSE) for the north, east and down (vertical) position of the aircraft for each point in the computed trajectory. A RMSE value of less than 4 centimeters for the north and east position is acceptable, while a value of less than 8 centimeters is acceptable for the down position.

Table 3. Smoothed Solution Status Parameters in POSPAC MMS v6.2

Parameter	Optimal values
Number of satellites	More than 6 satellites
Position Dilution of Precision (PDOP)	Less than 3
Baseline Length	Less than 30 km
Processing mode	Less than or equal to 1, however short bursts of values greater than 1 are acceptable.

3.2.3 LiDAR Point Cloud Rectification

The trajectory file (SBET) and its corresponding accuracy file (SMRMSG) generated in POSPAC are merged with the Range file to compute the coordinates of each individual point. The coordinates of points within the overlap region of contiguous strips vary due to small deviations in the trajectory computation for each strip. These strip misalignments are corrected by matching points from overlapping laser strips. This is done by the Lidar Mapping Suite (LMS) software developed by Optech.

LMS is a LiDAR software package used for automated LiDAR rectification. It has the capability to extract planar features per flight line and to form correspondence among the identical planes available in the overlapping areas (illustrated in Figure 10). In order to produce geometrically correct point cloud, the redundancy in the overlapping areas of flight lines is used to determine the necessary corrections for the observations.



Methodology

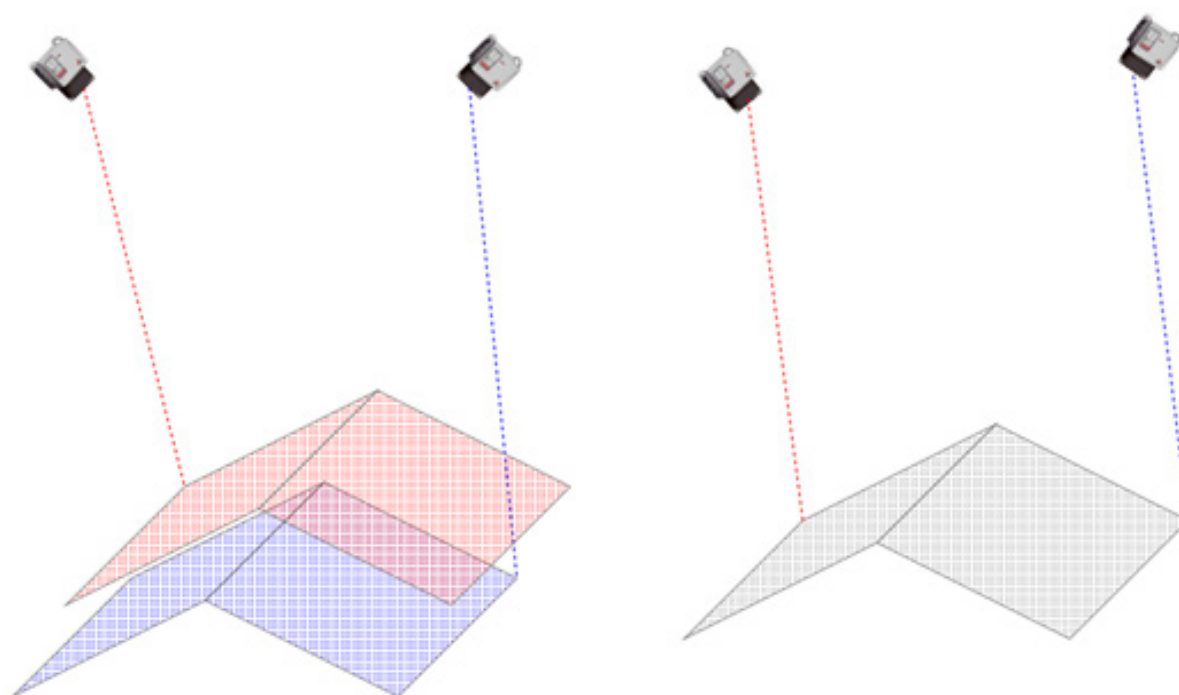


Figure 10. Misalignment of a single roof plane from two adjacent flight lines, before rectification (left). Least squares adjusted roof plane, after rectification (right).

The orientation parameters are corrected in LMS by using least squares adjustment to obtain the best-fit parameters and improve the accuracy of the LiDAR data. The primary indicators of the LiDAR rectification accuracy are the standard deviations of the corrections of the orientation parameters. These values are seen on the Boresight corrections, GPS position corrections, and IMU attitude corrections, all of which are located on the LMS processing summary report. Optimum accuracy is obtained if the Boresight and IMU attitude correction standard deviations are less than 0.001° and if the GPS position standard deviations are below 0.01 m.

3.2.4 LiDAR Data Quality Checking

After the orientation parameters are corrected and the point cloud coordinates are computed, the entire point cloud data undergoes quality checking, to see if: (a) there are remaining horizontal and vertical misalignments between contiguous strips, and; (b) to check if the density of the point cloud data reach the target density for the site. The LAStools software is used to compute for the elevation difference in the overlaps between strips and the point cloud density. It is a software package developed by Rapidlasso GmbH for filtering, tiling, classifying, rasterizing, triangulating and quality checking Terabytes of LiDAR data, using robust algorithms, efficient I/O tools and memory management. LAStools can quickly create raster representing the computed quantities, which provide guiding images in determining areas where further quality checks are necessary. The target requirements for floodplain acquisition, computed by LAStools, are shown in Table 4.

Methodology

Table 4. Parameters investigated during quality checks

Criteria	Requirement
Minimum per cent overlap	25%
Average point cloud density per square meter	2.0
Elevation difference between strips (on flat areas)	0.20 meters

LAStools can provide guides where elevation differences probably exceed the 20 centimeters limit. An example of LAStools output raster visualizing points in the flight line overlaps with a vertical difference of +/- 20 centimeters (displayed as dense red/blue areas) is shown in Figure 11.

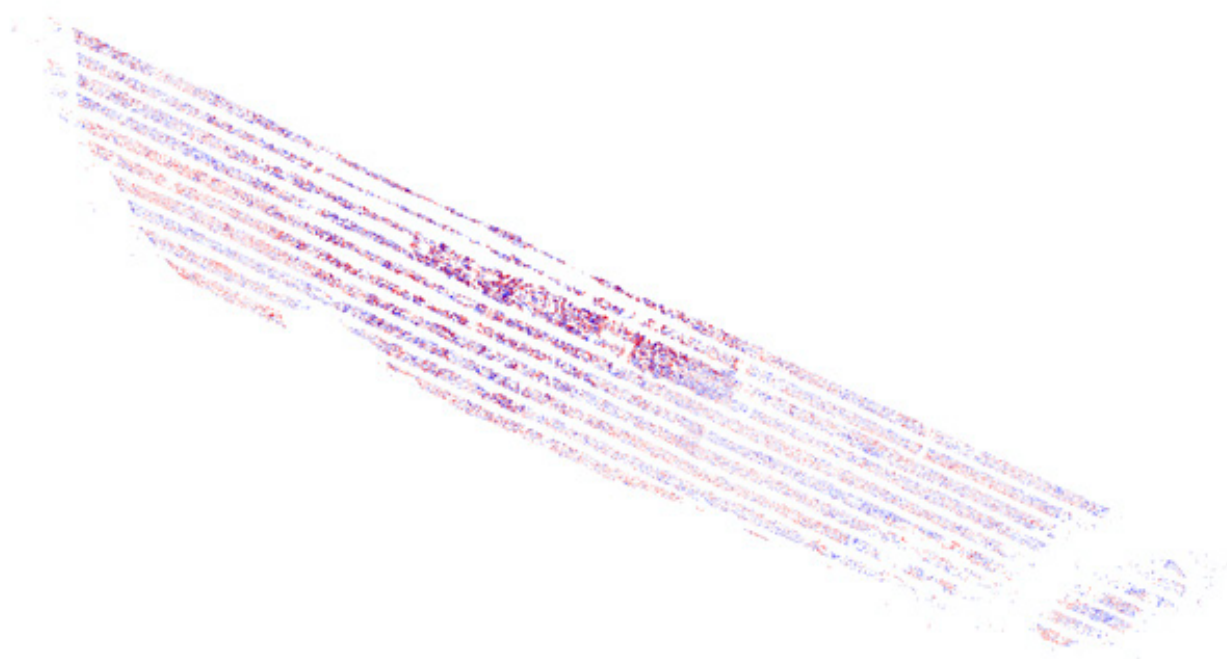


Figure 11. Elevation difference between flight lines generated from LAStools

To investigate the occurrences of elevation differences in finer detail, the profiling tool of Quick Terrain Modeler software is used. Quick Terrain Modeler (QT Modeler) is a 3D point cloud and terrain visualization software package developed by Applied Imagery, Inc. The profiling capability of QT Modeler is illustrated in Figure 12.

Methodology

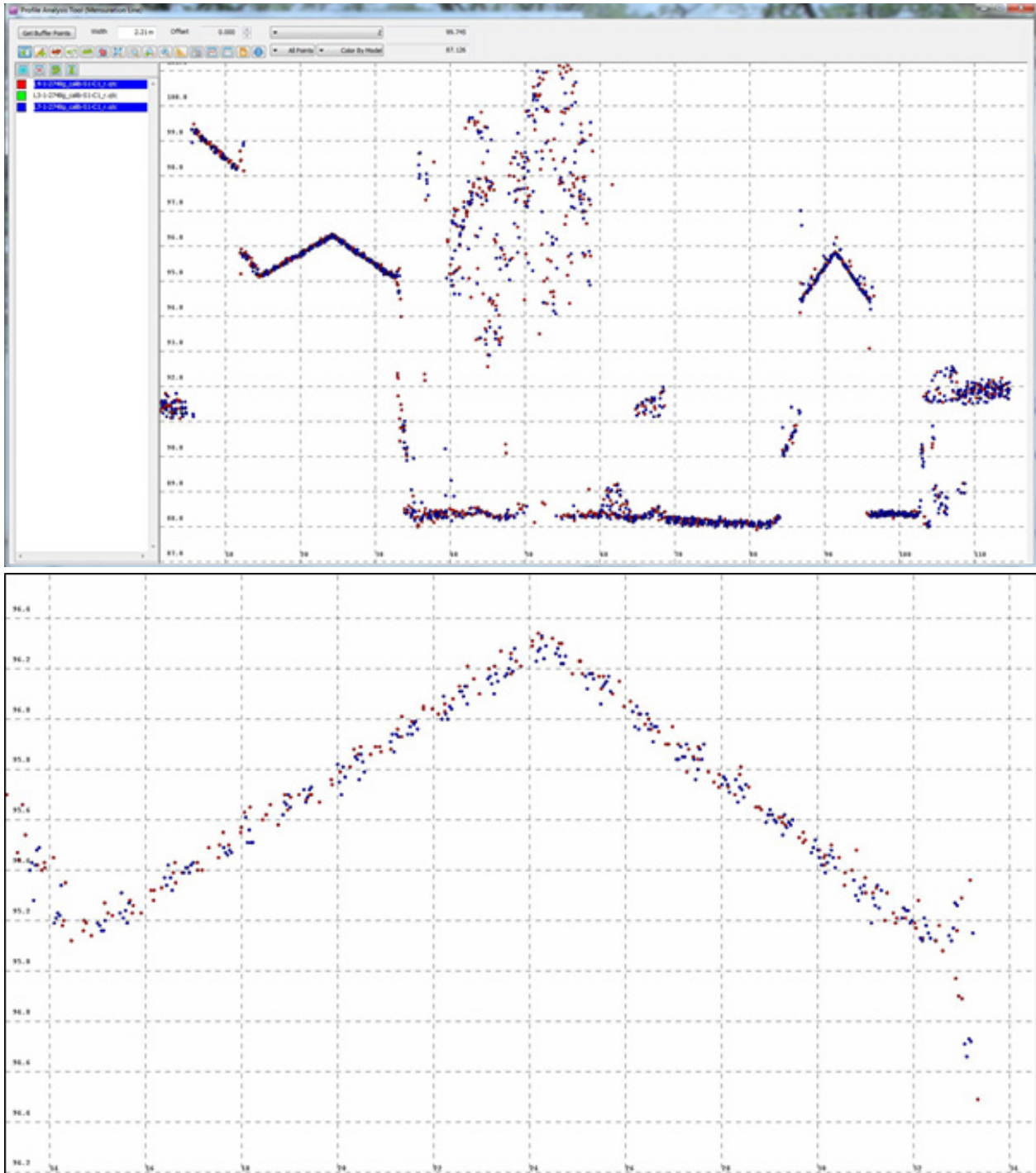


Figure 12. Profile over roof planes (a) and a zoomed-in profile on the area encircled in yellow (b)

The profile (e.g., over a roof plane) shows the overlapping points from different flight lines which serve as a good indicator that the correction applied by LMS for individual flight lines is good enough to attain the desired horizontal and vertical accuracy requirements. Flight lines that do not pass quality checking are subject for reprocessing in LMS until desired accuracies are obtained.

Methodology

3.2.5 LiDAR Point Cloud Classification and Rasterization

Point cloud classification commences after the point cloud data has been rectified. TerraScan is a TerraSolid LiDAR software suite used for the classification of point clouds. It can read airborne and vehicle-based laser data in raw laser format, LAS, TerraScan binary or other ASCII-survey formats. Its classification and filtering routines are optimized by dividing the whole data into smaller geographical datasets called blocks, to automate the workflow and increase efficiency. In this study, the blocks were set to 1 kilometer by 1 kilometer with a 50 m buffer zone to prevent edge effects.

The process includes the classification of all points into Ground, Low Vegetation, Medium Vegetation, High Vegetation and Buildings. The classifier tool in TerraScan first filters air points and low points by finding points that are 5 standard deviations away from the median elevation of a search radius, which is 5 meters by default. It then divides the region into 60m by 60m search areas (the maximum area where at least one laser point hits the ground) and assigns the lowest points in these areas as the initial ground points from which a triangulated ground model is derived. The classifier then iterates through all the points and adds the points to the ground model by testing if it is (a) within the maximum iteration angle of 4° by default from a triangle plane, and (b) if it is within the maximum iteration distance (1.2 m by default) from a triangle plane. The ground plane is continuously updated from these iterations. The ground classification technique is illustrated in Figure 13. It is apparent that the smaller the iteration angle, the less eager the classifier is to follow changes in the point cloud (small undulations in terrain or hits on low vegetation). An angle close to 4° is used in flat terrain areas while an angle of 10° is used in mountainous or hilly terrains.

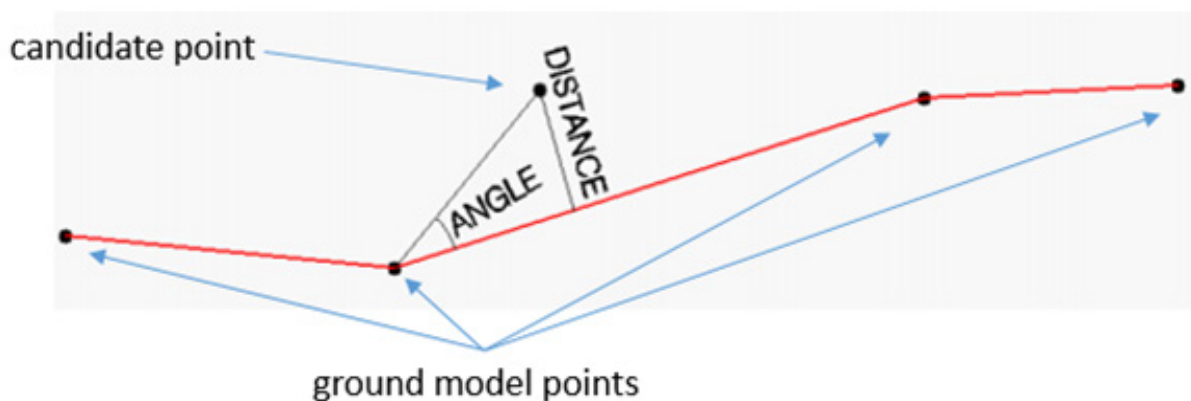


Figure 13. Ground classification technique employed in Terrascan

The parameters for ground classification routines used in floodplain and watershed areas are listed in Table 5.

Table 5. Ground classification parameters used in Terrascan for floodplain and watershed areas

Classification maximums	Floodplain (default)	Watershed (adjusted)
Iteration angle (degrees)	4	8
Iteration distance (meters)	1.20	1.50

Methodology

The comparison between the produced DTM using the default parameters versus the adjusted is shown in Figure 14. The default parameters may fail to capture the sudden change in the terrain, resulting to less points being classified as ground that makes the DTM interpolated (Figure 14a). The adjusted parameters works better in these spatial conditions as shown in Figure 14b. Statistically, the number of ground points and model key points correctly classified can increase by as much as fifty percent (50%) when using the adjusted parameters.

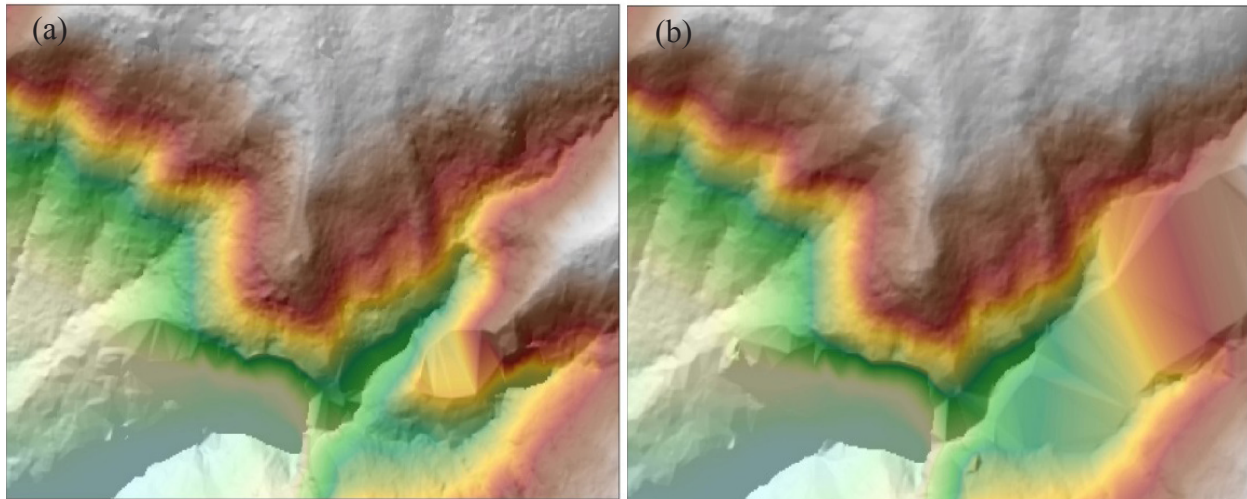


Figure 14. Resulting DTM of ground classification using the default parameters (a) and adjusted parameters (b)

The classification to Low, Medium and High vegetation is a straightforward testing of how high a point is from the ground model. The range of elevation values and its corresponding classification is shown in Table 6.

Table 6. Classification of Vegetation according to the elevation of points

Elevation of points (meters)	Classification
0.05 to 0.15	Low Vegetation
0.15 to 2.50	Medium Vegetation
2.50 to 50.0	High Vegetation

The classification to Buildings routine tests points above two meters (2.0 m) if they only have one echo, and if they form a planar surface of at least 40 square meters with points adjacent to them. Minimum size and Z tolerance are the parameters used in the classify buildings routine as shown in Figure 15.

Methodology

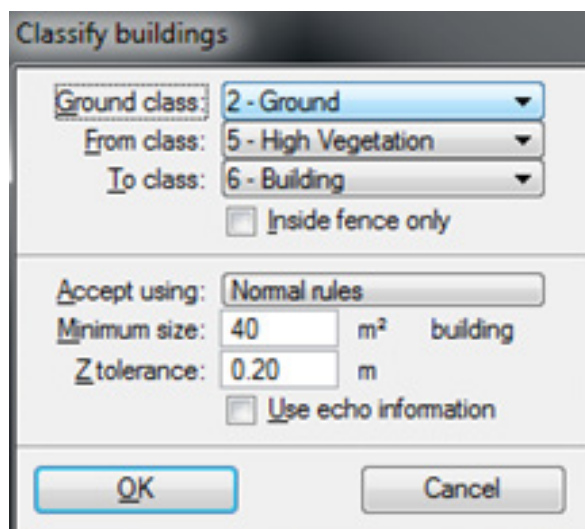


Figure 15. Default TerraScan building classification parameters

Minimum size is set to the smallest building footprint size of 40 square meters while the Z tolerance of 20 centimeters is the approximate elevation accuracy of the laser points.

The point cloud data are examined for possible occurrences of air points which are to be deleted manually in the TerraScan window. Air points are defined as groups of points which are significantly higher or lower from the ground points. The different examples of air points are shown in Figure 16.

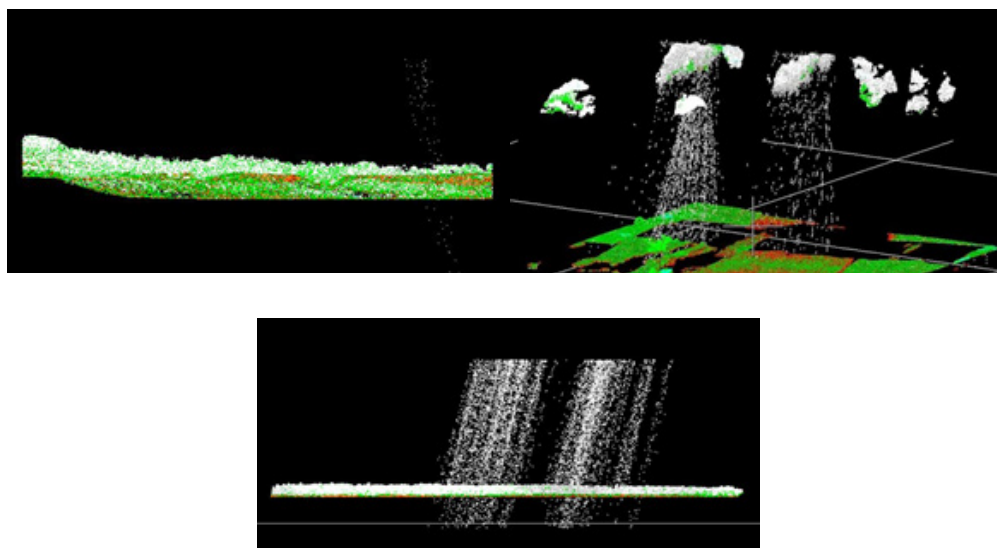


Figure 16. Different examples of air points manually deleted in the TerraScan window

The noise data can be as negligible as shown in Figure 16a or can be as severe as the one shown in Figure 16c. A combination of cloud points and shower of short ranges is displayed in Figure 16b. Shower of short ranges are caused by signal interference from the radio transmission of the tower and the aircraft. During every transmission on a specific frequency (around 120MHz), the signal is getting distorted due to the interference causing showers of short ranges in the output LAS.

Methodology

Classified LiDAR point clouds that are free of air points, noise and unwanted data are processed in TerraScan to produce Digital Terrain Model (DTM) and the corresponding first and last return Digital Surface Models (DSM). These ground models are produced in the American Standard Code for Information Interchange format (ASCII) format. DTMs are produced by rasterizing all points classified to ground and model key points in a 1 m by 1 m grid. The last return DSMs are produced by rasterizing all last returns from all classifications (Ground, Model Key Points, Low, Medium, High Vegetation, Buildings and Default) in a 1 m by 1 m grid. The first return DSMs on the other hand are produced by rasterizing all first returns from all classifications. Power lines are usually included in this model. All of these ground models are used in the mosaicking, manual editing and hydro correction of the topographic dataset, in preparation for the floodplain hydraulic modelling.

3.2.6 DEM Editing and Hydro-correction

Even though the parameters of the classification routines are optimized, various digital elevation models (DTM, first and last return DSM) that are automatically produced may still display minor errors that still need manual correction to make the DEMs suitable for fine-scale flood modelling. This is true especially for features that are under heavy canopy. Natural embankments on the side of the river might be flattened or misrepresented because no point pierced the canopy on that area. The same difficulty might also occur on smaller streams that are under canopy. The DTM produced might have discontinuities on these channels that might affect the flood modelling negatively. Manual inspection and correction is still a very important part of quality checking the LiDAR DEMs produced.

To correctly portray the dynamics of the flow of water on the floodplain, the river geometry must also be taken into consideration. The LiDAR data must be made consistent to the topographic surveys done for the area, and the bathymetric data must be “burned”, or integrated, into the DEM to make the dataset suitable for hydraulic analyses. However, no cross-sectional survey was performed for this area.





Results and Discussion

Results and Discussion

4.1 LiDAR Data Acquisition in Agno Floodplain

4.1. Flight Plans

Plans were made to acquire LiDAR data within the Agno floodplain. Each flight mission had an average of 10 flight lines and ran for at most 2 hours including take-off, landing and turning time. The parameter used in the LiDAR system for acquisition is found in Table 7.

Table 7. Parameters used in LiDAR System during Flight Acquisition

Fixed Variables	Values		
Flying Height (AGL – Above Ground Level) (m)	750	1000	1200
Overlap	30 %	30 %	30 %
Max. field of View (θ)	50	50	50
Speed of Plane (kts)	130	130	130
Turn around minutes	5	5	5
Swath (m)	661.58m	882m	1058.53m

The parameters that set in the LiDAR sensor to optimize the area coverage following the objectives of the project and to ensure the aircraft's safe return to the airport (base of operations) are shown in Table 7. Each flight acquisition is designed for four operational hours. The maximum flying hours for Cessna 206H is five hours.



Results and Discussion

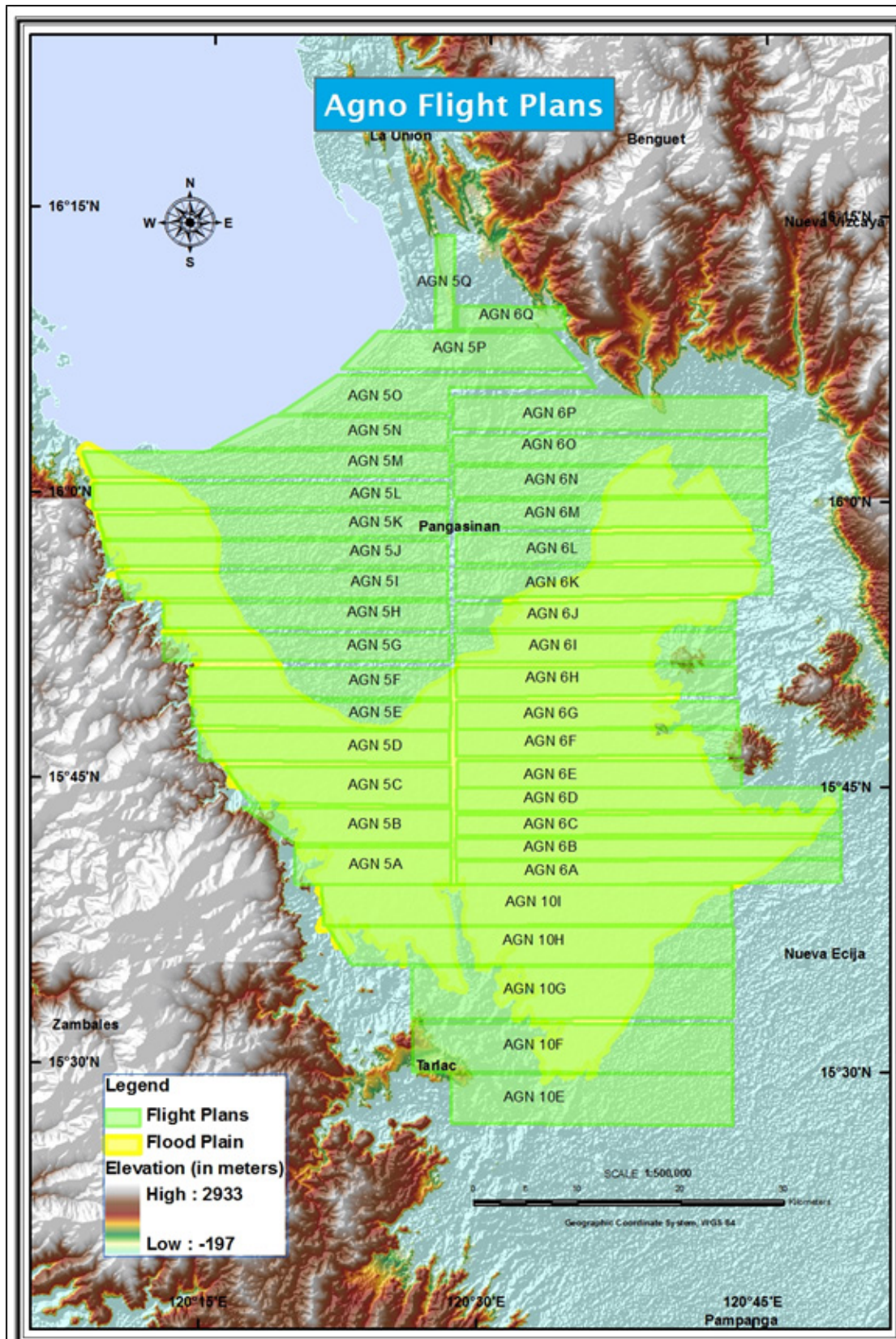


Figure 17. Agno floodplain flight plans

Results and Discussion

4.1.2 Ground Base Station

The project team was able to recover three (3) NAMRIA control stations; TRC-1 with first (1st) order accuracy, PNG-56 with second (2nd) order accuracy and PNG-3235 with fourth (4th) order accuracies. The certification for the base station is found in Annex E. The team also established ground control points, namely, WCC-1 and WCC-2. The ground control point (GCP) was used as reference point during flight operations using TRIMBLE SPS R8, a dual frequency GPS receiver.

Table 8. Details of DVS-1 GCP used as base station for the LiDAR Acquisition

Station Name	TRC-1	
Order of Accuracy	1st	
Relative Error (horizontal positioning)	1 in 100,000	
Geographic Coordinates, Philippine Reference of 1992 Datum (PRS 92)	Latitude	15° 28' 44.13765"
	Longitude	120° 35' 52.67202"
	Ellipsoidal Height	46.89100 meters
Grid Coordinates, Philippine Transverse Mercator Zone 5 (PTM Zone 5 PRS 92)	Easting	456859.89 meters
	Northing	1711833.357 meters
Geographic Coordinates, World Geodetic System 1984 Datum (WGS 84)	Latitude	15° 28' 38.48550" North
	Longitude	120° 35' 57.49329" East
	Ellipsoidal Height	88.90220 meters
Grid Coordinates, Universal Transverse Mercator Zone 51 North (UTM 51N WGS 1984)	Easting	242278.30 meters
	Northing	1712636.20 meters

Table 9. Details of the recovered NAMRIA horizontal control point PNG-56 used as base station for the LiDAR Acquisition.

Station Name	PNG-56	
Order of Accuracy	2nd	
Relative Error (horizontal positioning)	1 in 50,000	
Geographic Coordinates, Philippine Reference of 1992 Datum (PRS 92)	Latitude	15° 52' 46.68500"
	Longitude	120° 34' 54.80152"
	Ellipsoidal Height	30.68000 meters
Grid Coordinates, Philippine Transverse Mercator Zone 3 (PTM Zone 3 PRS 92)	Easting	455222.371 meters
	Northing	1756173.446 meters
Geographic Coordinates, World Geodetic System 1984 Datum (WGS 84)	Latitude	15° 52' 40.94082" North
	Longitude	120° 34' 59.68898" East
	Ellipsoidal Height	69.55900 meters
Grid Coordinates, Universal Transverse Mercator Zone 51 North (UTM 51N WGS 1984)	Easting	241,058.87 meters
	Northing	1767009.80 meters



Results and Discussion

Table 10. Details of the recovered NAMRIA horizontal control point PNG-3235 used as base station for the LiDAR Acquisition.

Station Name	PNG-3235	
Order of Accuracy	4th	
Relative Error (horizontal positioning)	1 in 10,000	
Geographic Coordinates, Philippine Reference of 1992 Datum (PRS 92)	Latitude Longitude Ellipsoidal Height	15° 54' 53.39177" 120° 22' 37.60736" 14.36100 meters
Grid Coordinates, Philippine Transverse Mercator Zone 3 (PTM Zone 3 PRS 92)	Easting Northing	433302.82 meters 1760122.49 meters
Geographic Coordinates, World Geodetic System 1984 Datum (WGS 84)	Latitude Longitude Ellipsoidal Height	15° 54' 47.62346" North 120° 22' 42.39285" East 52.53700 meters
Grid Coordinates, Universal Transverse Mercator Zone 51 North (UTM 51N WGS 1984)	Easting Northing	219166.89 meters 1761170.53 meters

Table 11. Details of established Ground Control Points by Data Acquisition Component for LiDAR survey in Agno Floodplain.

Point Name	Location	WGS '84 Coordinates		Ellipsoidal Height (m)
		Latitude	Longitude	
WCC-1	WCC Airport, Binalonan, Pangasinan	16° 03' 12.65810	120° 34' 56.38599	80.125
WCC-2	WCC Airport, Binalonan, Pangasinan	16° 03' 13.12892	120° 34' 56.31340	80.855

Results and Discussion



Figure 18. PNG-56 located in the town plaza fronting Sto. Tomas Municipal Hall in Pangasinan.

Results and Discussion

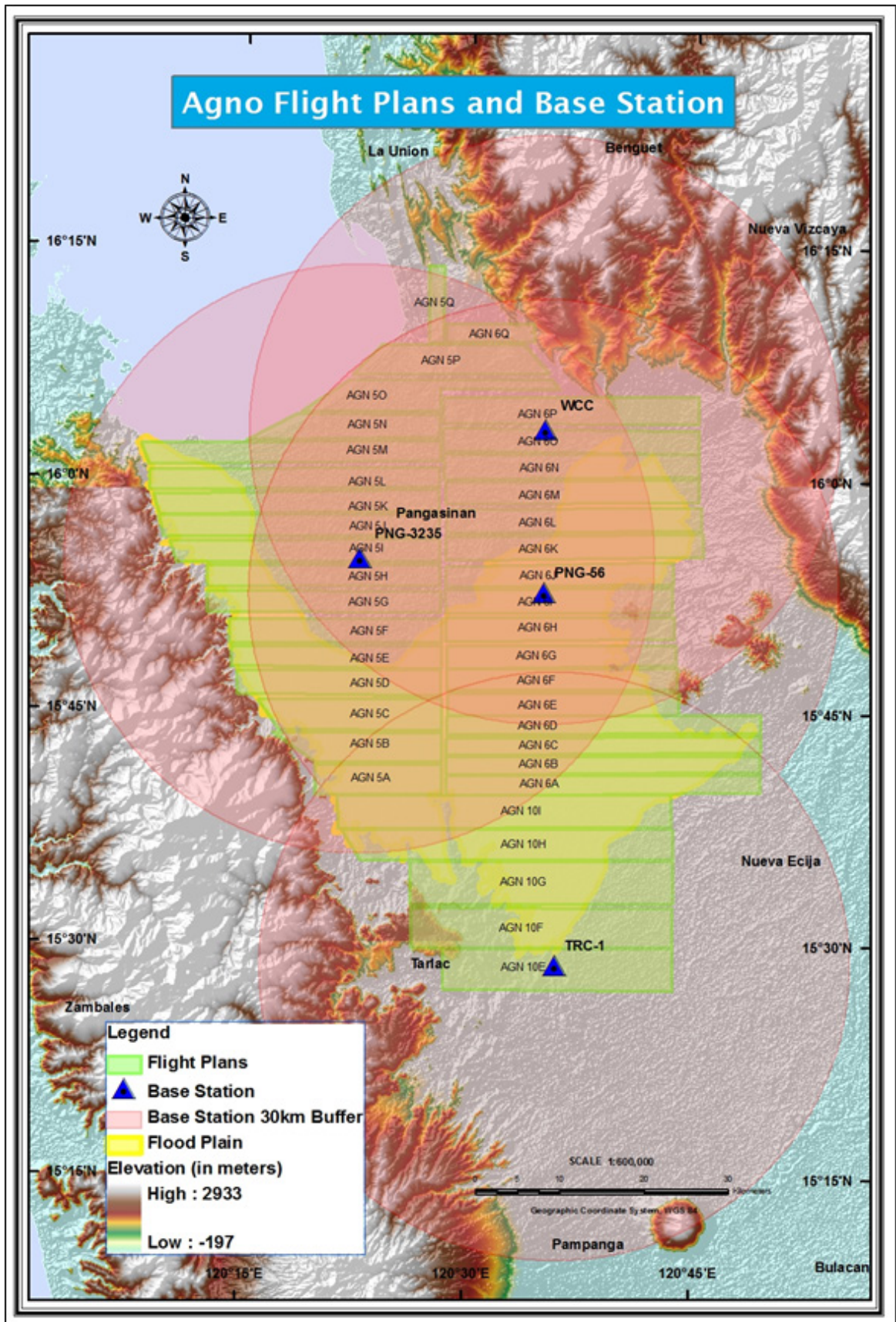


Figure 19. Agno floodplain flight plans and base station

Results and Discussion

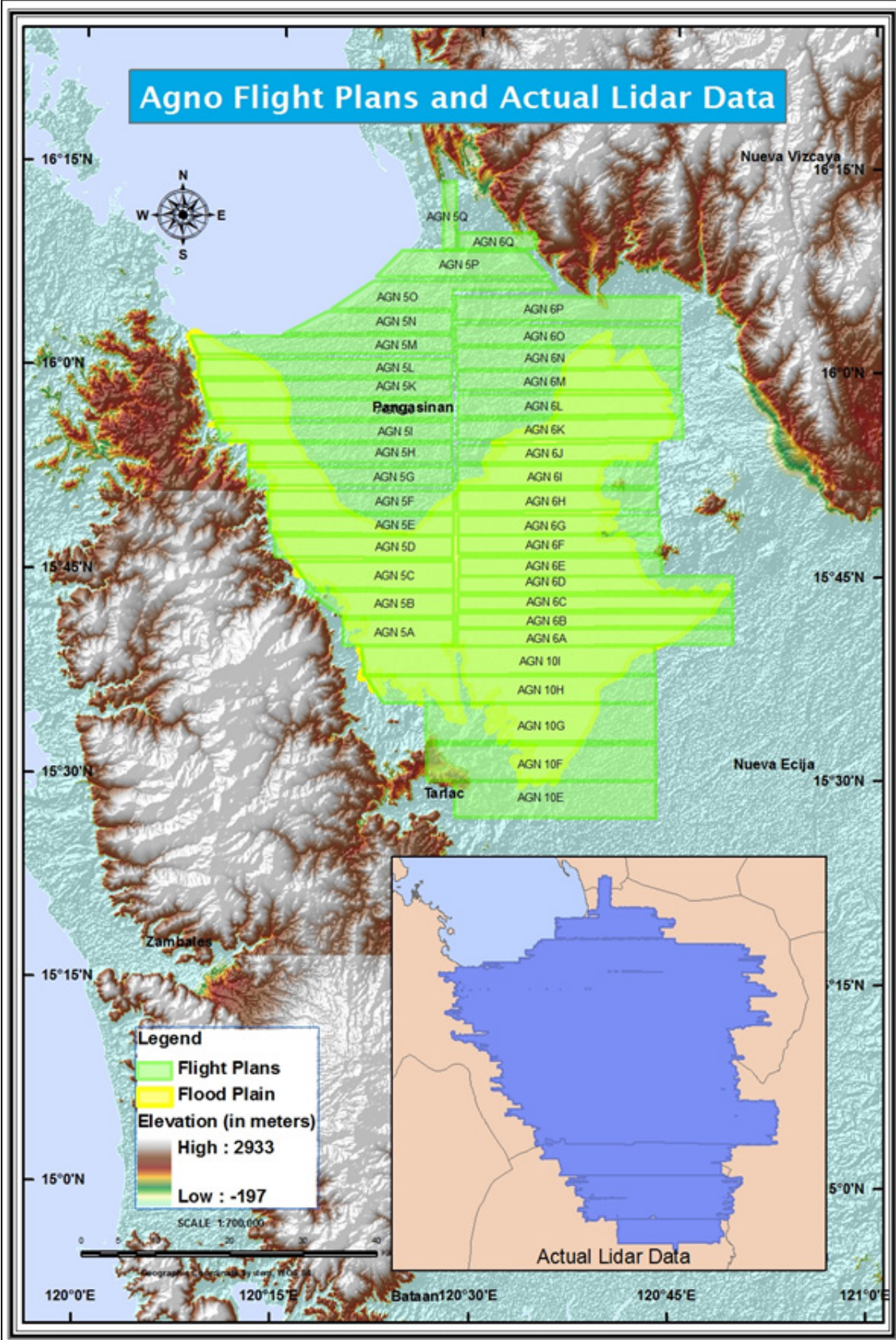


Figure 20. Agno floodplain data acquisition LAS output

Results and Discussion

Table 12. Flight Missions for LiDAR Data Acquisition in Agno floodplain

Date Surveyed	Name	Flight Plan Area (km ²)	Sur-veyed Area (km ²)	Area Sur-veyed within the River Systems (km ²)	Area Sur-veyed Outside the River Systems (km ²)	No. of Images (Frames)	Flying Hours	
							Hr	Min
Jan 10, 2013	Agno10E	195.06	25.334	25.334	0	1062	4	6
Jan 10, 2013	Agno10F	134.29	19.94	19.94	0	No Camera data	2	38
Jan 10, 2013	Ag-no10G1	158.86	205.02	112.67	92.35	713	2	35
Jan 10, 2013	Agno10 G2					No Camera data	2	40
Jan 11, 2013	Agno10H	155.07	219.69	154.74	64.95	No Camera data	2	40
Feb 18, 2013	Agno10I1	144.74	171.4	136	35.4	728	3	0
Jan 11, 2013	Agno10I2					No Camera Data	3	19
January 22, 2013	AGN6N	89.466	103.9	48.561	55.339	876	3	43
Jan 24, 2013	AGN6L	94.76	125.49	78.927	46.563	482	3	0
Jan 25, 2013	AGN6K	90.496	142.16	109.846	32.314	1065	4	3
Jan 26, 2013	AGN6J	70.109	97.786	82.298	15.488	650	3	37
Jan 28, 2013	AGN6I	85.537	121.48	112.012	9.468	713	3	35
Jan 28, 2013	AGN6H	87.854	103.44	103.44	0	760	3	28
Jan 29, 2013	AGN6G	78.947	112.58	112.58	0	796	3	40
Jan 29, 2013	AGN6F	69.852	100.36	100.36	0	449	3	30
Jan 30, 2013	AGN6E	77.229	101.01	101.01	0	415	3	45
Jan 30, 2013	AGN6D	90.601	131.34	121.451	9.889	369	3	15
Feb 2, 2013	AGN6C	124.3	101.26	23.04	0	526	4	10
Feb 4, 2013	AGN6B	119.92	94.937	24.983	0	375	3	30
Feb 4, 2013	AGN5N	62.152	73.324	0	0	287	2	50
Feb 5, 2013	AGN6A	90.665	115.61	81.463	34.147	299	4	10
Feb 19, 2013								3
Feb 5, 2013	AGN5O	69.789	101.68	0	0	342	3	0
Feb 6, 2013	AGN5E	72.463	84.546	84.546	0	634	3	30
Feb 6, 2013	AGN5D	71.413	97.637	97.637	0	283	3	10
Feb 7, 2013	AGN5F	71.996	88.91	88.91	0	775	3	30
Feb 8, 2013	AGN5C	75.112	94.221	94.221	0	591	3	54
Feb 11, 2013	AGN5A	57.688	75.357	75.357	0	334	3	27



Results and Discussion

Feb 19, 2013	AGN5A	57.688	75.357	75.357		228	3	26
Feb 28, 2013	AGN5Q	41.522	60.938		0	748	4	0
Feb 4, 2013	AGN5P	71.776	119.1	0	0	No Camera data	3	30
Feb 5, 2013	AGN5M	97.56	130.74	18.039	112.701	434	3	55
Feb 6, 2013	AGN5L	98.716	116.6	42.717	73.883	492	4	8
Feb 8, 2013	AGN5K	88.684	113.98	43.064	70.916	446	3	58
Feb 28, 2013	AGN5K	88.684	113.98	43.064	70.916	446	4	20
Feb 9, 2013	AGN5J	85.887	124.49	49.21	75.28	416	3	37
Feb 9, 2013	AGN5I	90.26	112.58	45.019	67.561	356	3	40
Feb 11, 2013	AGN5H	72.226	104.43	104.43	68.607	134	2	43
Feb 12, 2013	AGN5H	72.226	104.43	104.43	68.607	358	3	30
Feb 19, 2013	AGN6O	86.856	124.21	51.89	72.32	269	3	10
Feb 26, 2013	AGN6BS					337	3	35
Feb 26, 2013	AGN6CS					685	2	

Forty three (43) missions were conducted to complete the LiDAR Data Acquisition in Agno floodplains, for a total of one hundred forty nine (149) hours of flying time for RP-C9022 and RP-C9122. Twenty seven (27) missions were acquired using the Gemini LiDAR System while sixteen (16) are surveyed using the Pegasus LiDAR System. Table 12 shows the total area to be surveyed according to the flight plan and the total area of actual coverage per mission.

Agno floodplain with a total of one thousand and seven hundred twenty five square kilometers was surveyed from January 10, 2013 to December 28, 2013 by Christopher Cruz, James Novilla, Lovely Gracia Acuna, Iro Roxas, Mark Gregory V. Ano and Jasmine Alviar.

Table 13. Area of Coverage of the LiDAR Data Acquisition in Davao floodplain

Location	Date Surveyed	Operator	Mission Name	Flood-plain Surveyed Area (km ²)	Total Flood-plain Area (km ²)	Watershed Surveyed Area (km ²)	Total Watershed Area (km ²)
AGNO	10-Jan-13	JASMINE ALVIAR	1A10E10A	25.334	1,725	0	4,495
	10-Jan-13	MARK GREGORY AÑO	1A10F10B	19.94		0	
	10-Jan-13	IRO ROXAS	2AGN10G1010A	33.244		79.426	
	10-Jan-13	JAMES NOVILLA	2AGN10G2010B				



Results and Discussion

	11-Jan-13	MARK GREGORY AÑO	1A10H11A	80.63		74.11	
	18-Feb-13	IRO ROXAS	2AGNI1049B	114.418		21.582	
	11-Jan-13	LOVELY ACUÑA	2A6N10I2011A				
	22-Jan-13	IRO ROXAS	2AGN6N022A	26.142		22.419	
	24-Jan-13	IRO ROXAS	2AGN6L024A	54.376		24.551	
	25-Jan-13	LOVELY ACUÑA	2AGN6K025A	70.684		39.162	
	26-Jan-13	IRO ROXAS	2AGN6J026B	64.064		18.234	
	28-Jan-13	IRO ROXAS	2GN6I028A + AGN6Jline3	65.064		46.948	
	28-Jan-13	LOVELY ACUÑA	2AGN6H028B	66.231	1,725	37.209	4,495
	29-Jan-13	IRO ROXAS	2AGN6G029A + AGNGHline5	67.445		45.135	
	29-Jan-13	LOVELY ACUÑA	2AGN6F029B	67.605		32.755	
	30-Jan-13	IRO ROXAS	2AGN6E030A	85.126		15.884	
	30-Jan-13	LOVELY ACUÑA	2AGN6D030A	84.537		36.914	
	2-Feb-13	IRO ROXAS	2AGN6C033B	101.26		0	
	4-Feb-13	IRO ROXAS	2AGN6B035A	94.937		0	
	4-Feb-13	LOVELY ACUÑA	2AGN5N035B	58.268		17.089	
	5-Feb-13	IRO ROXAS	2AGN6A036A + AGN6Bline6	81.463		0	
	19-Feb-13	IRO ROXAS	2AGN6A050A				
	5-Feb-13	LOVELY ACUÑA	2AGN5O036B	0		0	
	6-Feb-13	IRO ROXAS	2A5E037A	63.643		20.903	
	6-Feb-13	LOVELY ACUÑA	2AGN5D037B	83.089		14.548	

Results and Discussion

	7-Feb-13	IRO ROXAS	2AGN5F038A	40.024		48.886	
	8-Feb-13	IRO ROXAS	2AGN5C039A + AGN5Dlines2&4	91.113		3.108	
	8-Feb-13	LOVELY ACUÑA	2AGN5B040B	63.29		31.081	
	11-Feb-13	LOVELY ACUÑA	2AGN5A042A	58.268		17.089	
	28-Feb-13	IRO ROXAS	2AGN5OQ059B	0		0	
	4-Feb-13	JAS- MINE ALVIAR	1A5P035B	0		0	
	5-Feb-13	MARK GREGO- RY AÑO	1A5M036A	12.439		5.6	
	6-Feb-13	MARK GREGO- RY AÑO	1A5L037B	29.758		12.959	
	8-Feb-13	JAS- MINE ALVIAR	1A5K039A	33.307		9.757	
	28-Feb-13	JAS- MINE ALVIAR	1A5KS059A				
	9-Feb-13	JAS- MINE ALVIAR	1A5J039A	31.454		17.756	
	9-Feb-13	CHRIS- TOPHER CRUZ	1A5I040B	27.412		17.607	
	11-Feb-13	MARK GREGO- RY AÑO	1A5H042A	24.694		79.736	
	12-Feb-13	JAS- MINE ALVIAR	1A5H043A				
	11-Feb-13	MARK GREGO- RY AÑO	1A5G042A	24.407		84.413	
	19-Feb-13	MARK GREGO- RY AÑO	1A6O050A	4.168		47.722	



Results and Discussion

	26-Feb-13	JAS-MINE ALVIAR	1A6BS057A				
	26-Feb-13	MARK GREGORY AÑO	1A6CS057B				

4.2 LiDAR Data Processing

4.2.1 Trajectory Computation

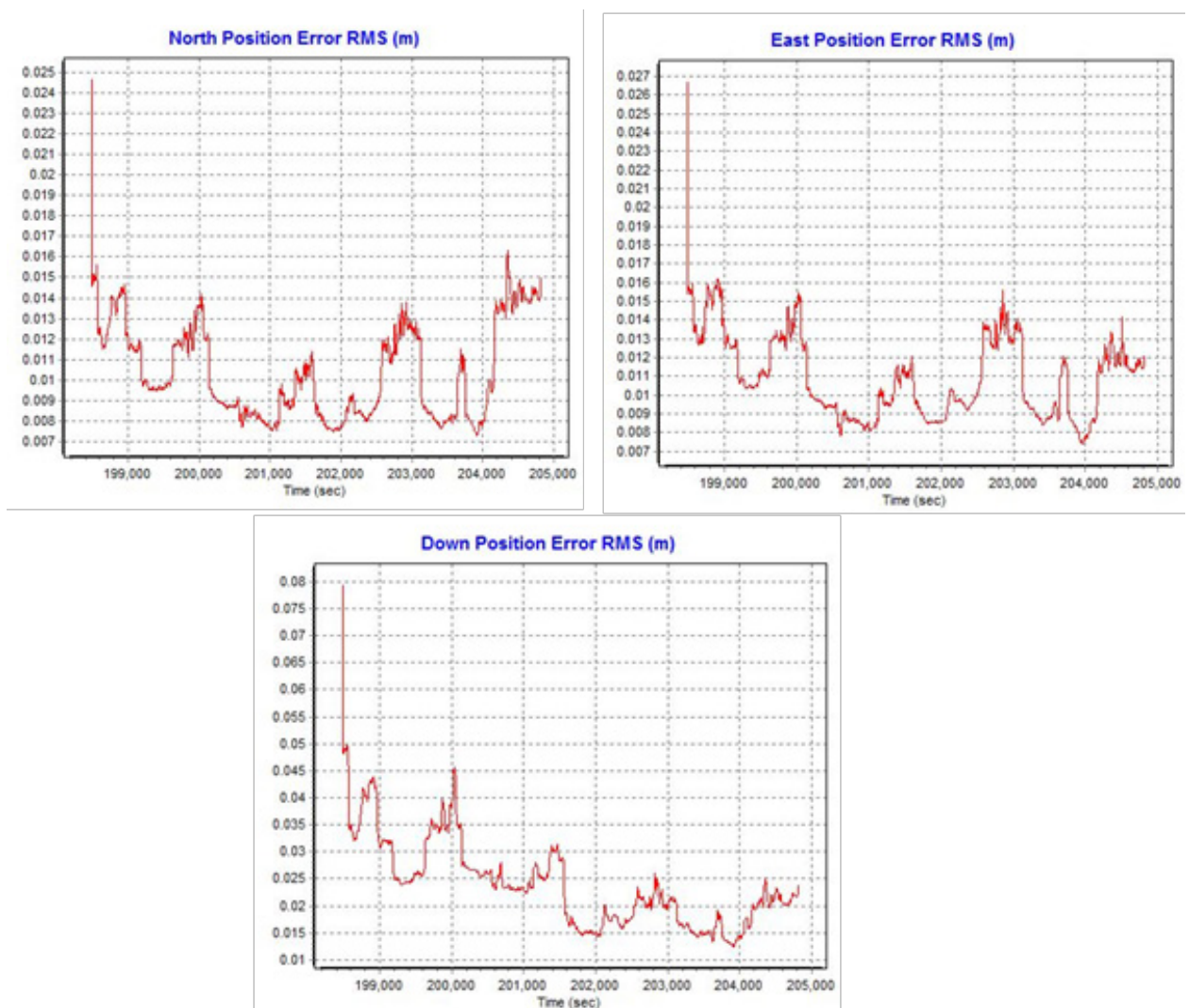


Figure 21. Smoothed Performance Metric Parameters of Agno flight

The Smoothed Performance Metric parameters of the Agno flight are shown in Figure 21. The x-axis is the time of flight, which is measured by the number of seconds from the midnight of the start of the GPS week. The y-axis is the RMSE value for a particular aircraft position with respect to GPS survey time. The North (Figure 21a) and east (Figure 21b) po-

Results and Discussion

sition RMSE values fall within the prescribed accuracy of 4 centimeter, and all Down (Figure 21c) position RMSE values fall within the prescribed accuracy of 8 centimeter.

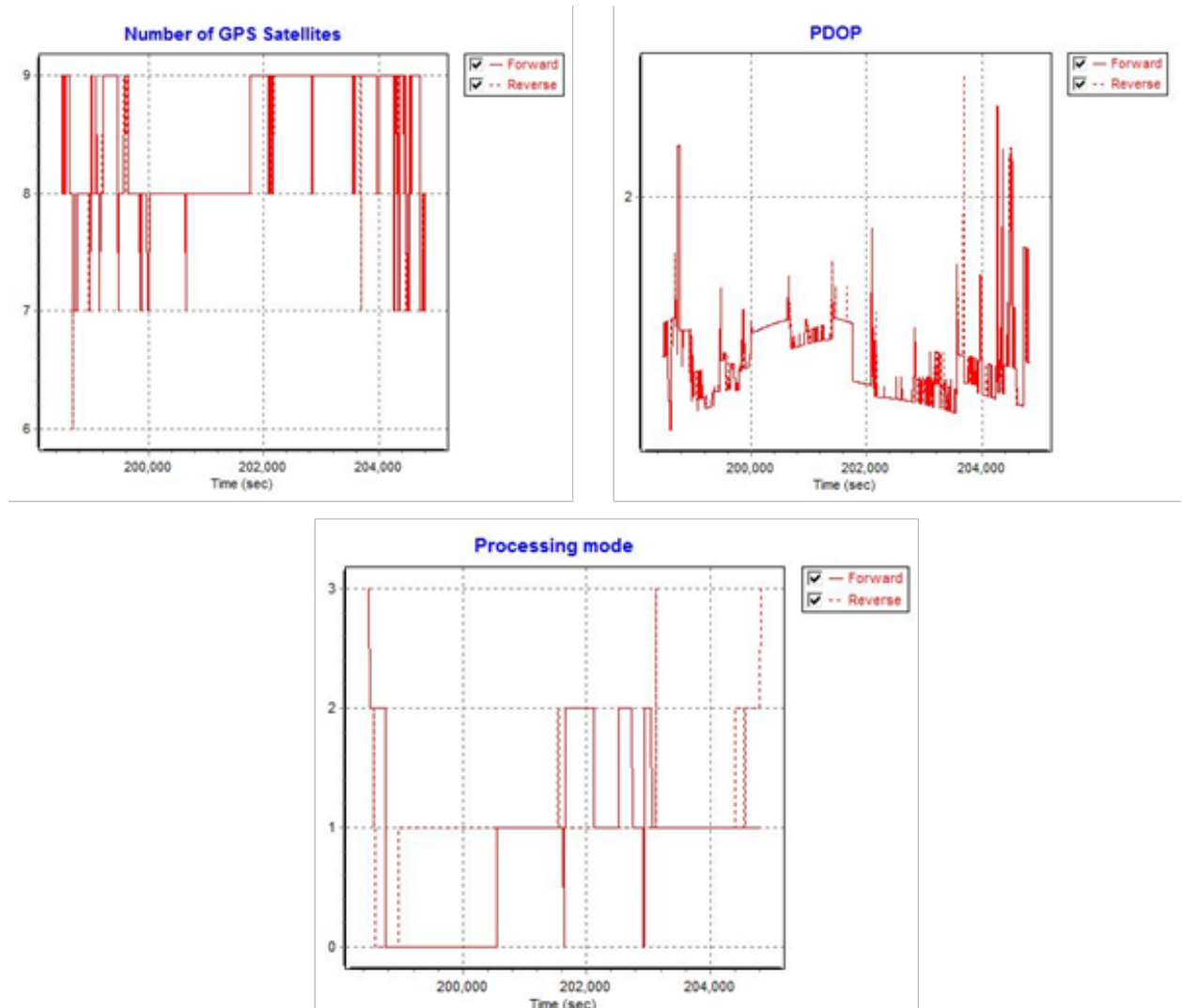


Figure 22. Solution Status Parameters of Agno flight

The Solution Status parameters of the computed trajectory for Agno flight, which are the number of GPS satellites, Positional Dilution of Precision (PDOP), and the GPS processing mode used are shown in Figure 22. The number of GPS satellites (Figure 22a) graph indicates that the number of satellites during the acquisition was between 7 and 9. The PDOP (Figure 22b) value does not exceed the value of 3, indicating optimal GPS geometry. The processing mode (Figure 22c) varies from 0 to 3, the value 0 corresponds to a Fixed, Narrow-Lane mode, which indicates an optimum solution for trajectory computation by POSpac MMS v6.2; the value 1 corresponds a Wide-Lane mode; and the value 2 corresponds a Float mode. All of the parameters satisfied the accuracy requirements for optimal trajectory solutions as indicated in the methodology.



Results and Discussion

4.2.2 LiDAR Point Cloud Computation

The LAS data output contains 12 flight lines, with each flight line containing two channels, a feature of the Pegasus system. The result of the boresight correction standard deviation values for both channel 1 and channel 2 are better than the prescribed 0.001. The position of the LiDAR system is also accurately computed since all GPS position standard deviations are less than 0.0016 meter. The attitude of the LiDAR system passed accuracy testing since the standard deviation of the corrected roll and pitch values of the IMU attitudes are less than 0.001 degrees.

4.2.3 LiDAR Data Quality Checking

The LAS boundary of the LiDAR data on top of the SRTM elevation data is shown in Figure 23. The map shows gaps in the LiDAR coverage that are attributed to cloud cover present during the survey.

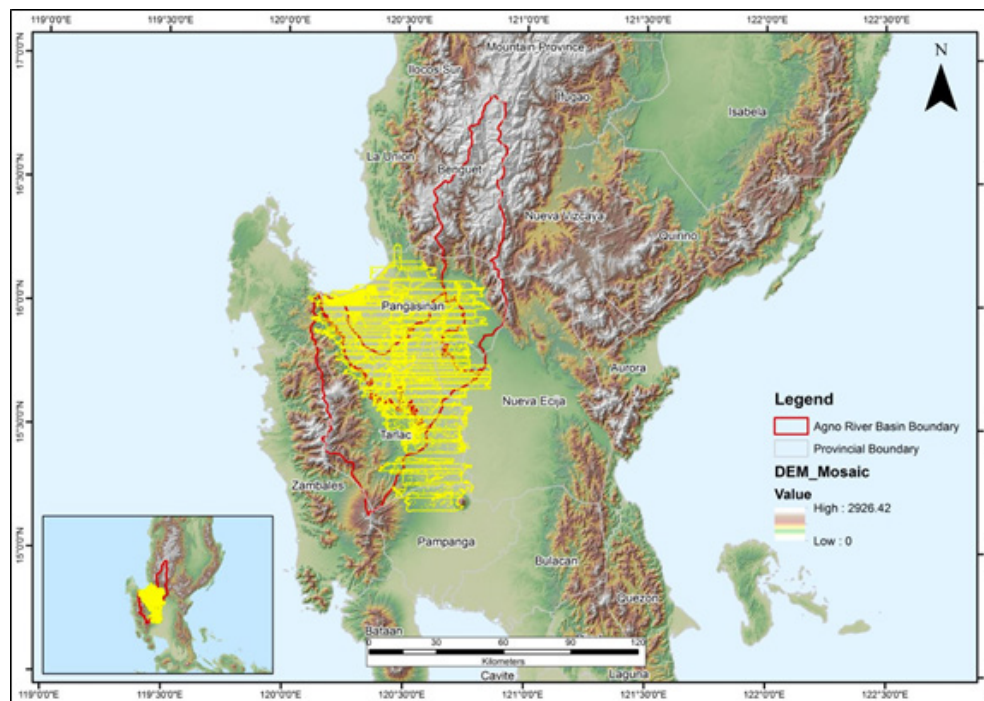


Figure 23. Coverage of LiDAR data for the Agno mission

The overlap data for the merged LiDAR data showing the number of channels that pass through a particular location is shown in Figure 24. Since the Pegasus system employs two channels, an average value of 2 (blue) for areas where there are only two overlapping flight lines, and a value of 3 (yellow) or more (red) for areas with three or more overlapping flight lines, are expected. The average data overlap for Agno is 34%.

Results and Discussion

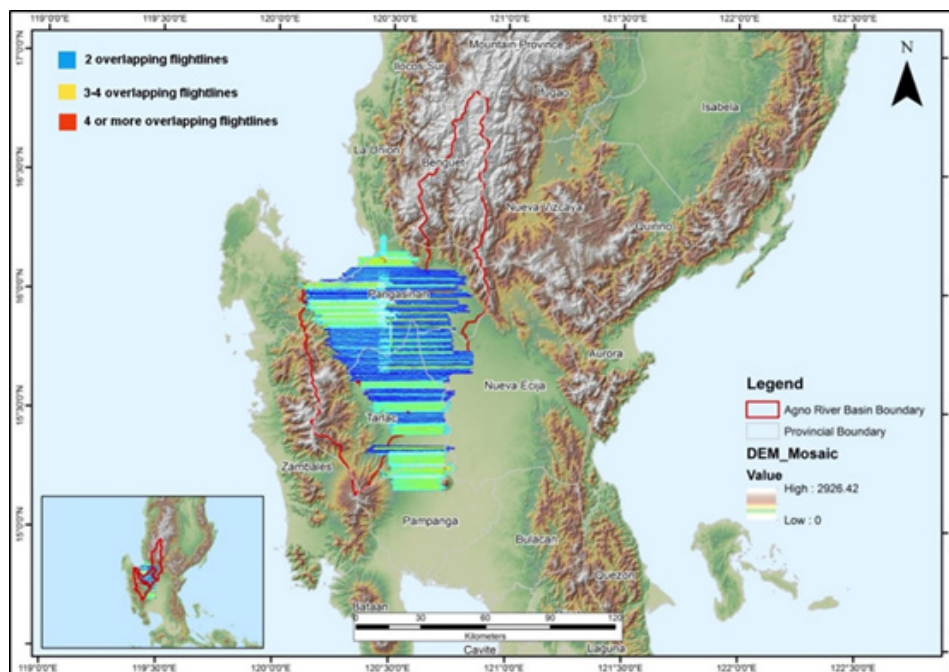


Figure 24. Image of data overlap for the Agno mission

The density map for the merged LiDAR data, with the red areas showing the portions of the data that satisfy the 2 points per square meter requirement, is shown in Figure 25. It was determined that 84.80% of the total area satisfied the point density requirement, and the average density for the entire survey area is 2.29 points per square meter.

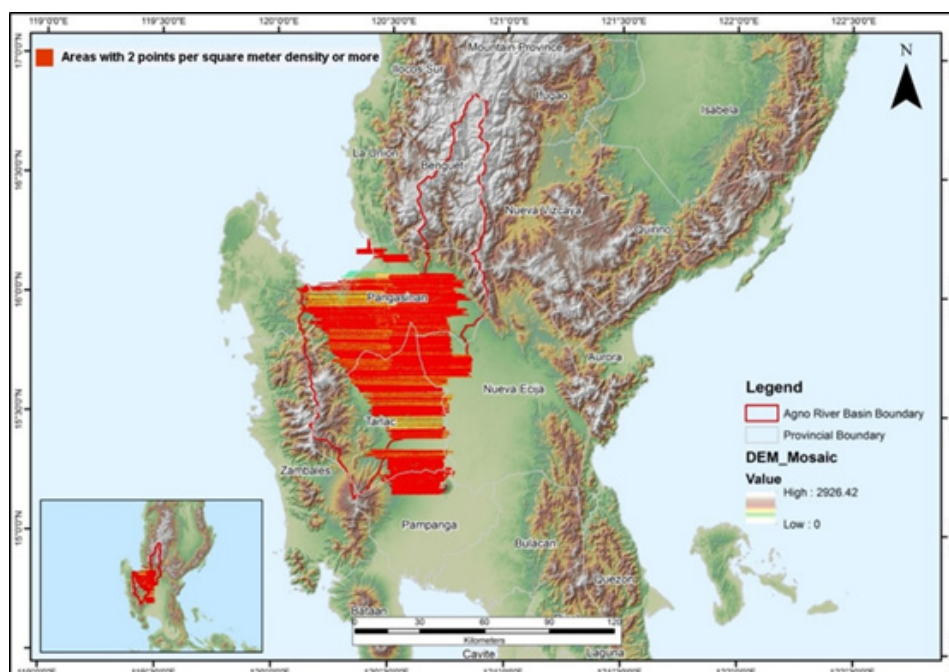


Figure 25. Density map of merged LiDAR data for the Agno mission

The elevation difference between overlaps of adjacent flight lines is shown in Figure 26. The default color range is from blue to red, where bright blue areas correspond to a -0.20 m difference, and bright red areas correspond to a +0.20 m difference. Areas with bright red or bright

Results and Discussion

blue need to be investigated further using QT Modeler.

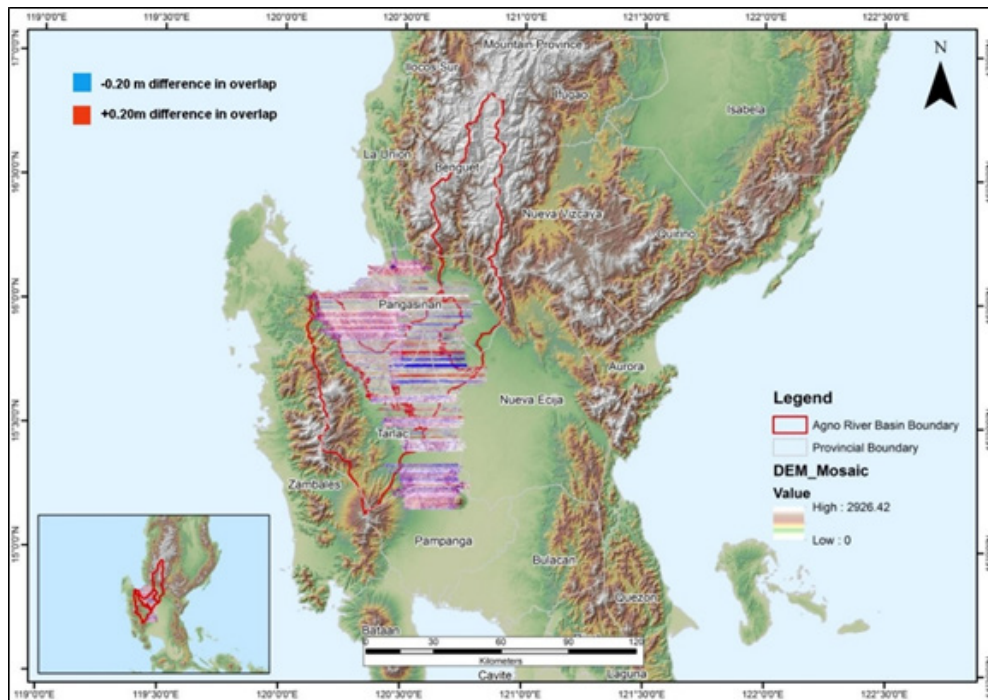


Figure 26. Elevation difference map between flight lines

A screen capture of the LAS data loaded in QT Modeler is shown in Figure 27a. A line graph showing the elevations of the points from all of the flight strips traversed by the profile in red line is shown in Figure 27b. It is evident that there are differences in elevation, but the differences do not exceed the 20-centimeter mark. No reprocessing was necessary for this LiDAR dataset.

Results and Discussion

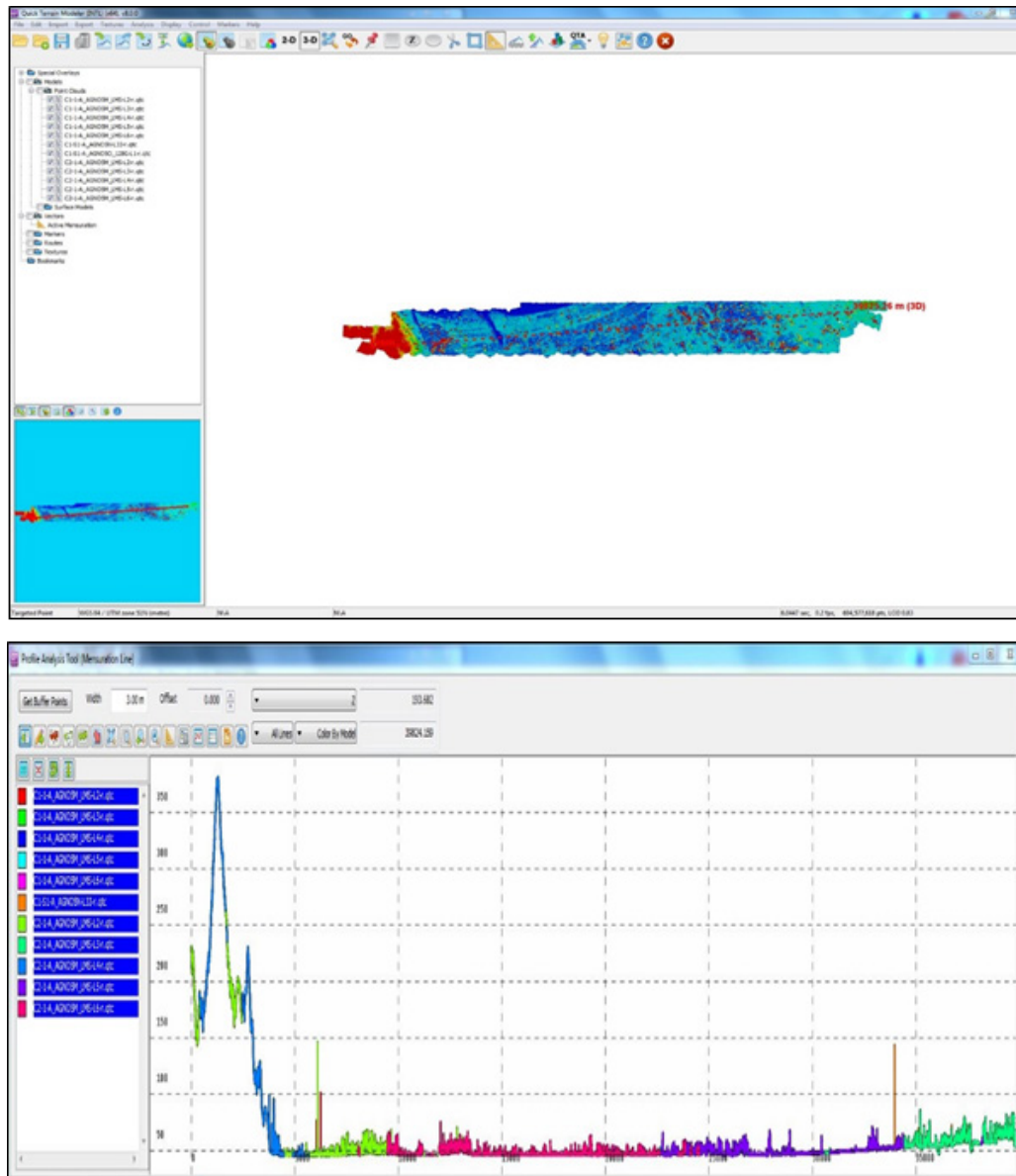


Figure 27. Quality checking with the profile tool of QT Modeler

4.2.4 LiDAR Point Cloud Classification and Rasterization

The block system that TerraScan employed for the LiDAR data is shown in Figure 28a generated a total of 10,073 1 kilometer by 1 kilometer blocks. The final classification of the point cloud for a mission in the Davao floodplain is shown in Figure 28b. The number of points classified to the pertinent categories along with other information for the mission is shown in Table 14.

Results and Discussion

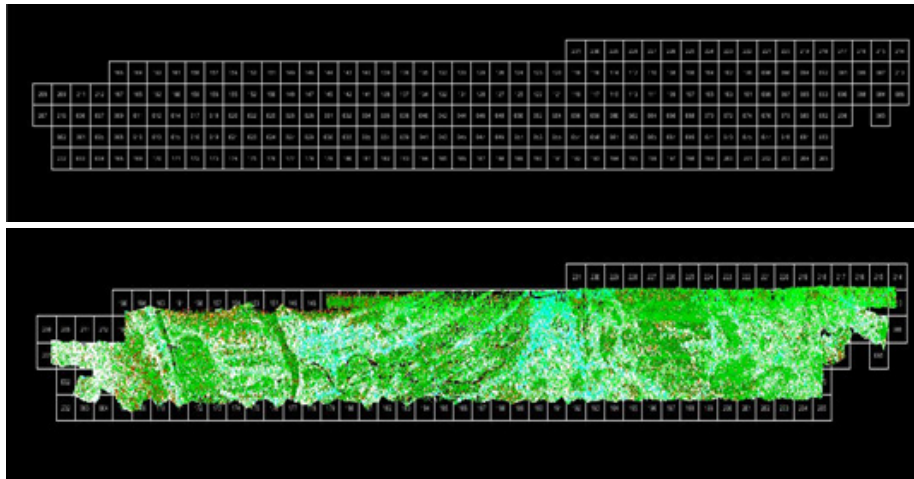


Figure 28. (a) Agno floodplains and (b) Agnoclassification results in TerraScan

Table 14. Agno classification results in TerraScan

Pertinent Class	Count
Ground	3,966,692,742
Low Vegetation	5,948,767,123
Medium Vegetation	6,327,709,626
High Vegetation	2,521,145,349
Building	491,467,976
Number of 1km x 1km blocks	10,073
Maximum Height	666.09
Minimum Height	43.27

An isometric view of an area before (a) and after (b) running the classification routines for the mission is shown in Figure 29. The ground points are in brown, the vegetation is in different shades of green, and the buildings are in cyan. It can be seen that residential structures adjacent or even below canopy are classified correctly, due to the density of the LiDAR data.

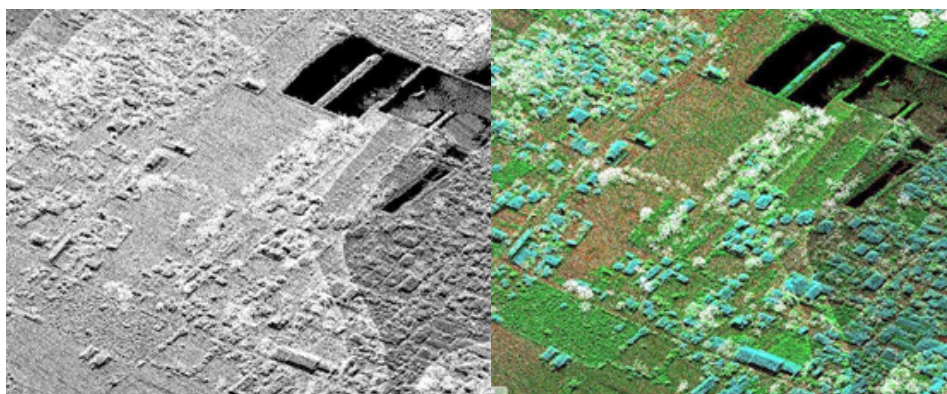


Figure 29. Point cloud (a) before and (b) after classification

Results and Discussion

4.2.5 DEM Editing and Hydro-correction

Portions of DTMs before and after manual editing are shown in Figure 30. It shows that the embankment might have been drastically cut by the classification routine in Figure 30a and clearly needed to be retrieved to complete the surface as in Figure 30b to allow to hydrologically correct flow of water. A small stream suffers from discontinuity of flow due to an existing bridge in Figure 30c. The bridge is removed also in order to hydrologically correct the flow of water through the river in Figure 30d.

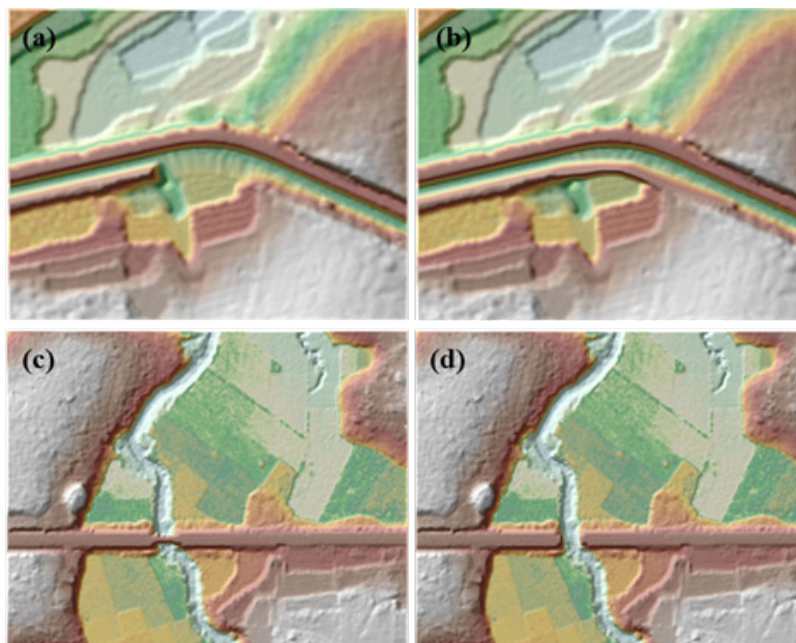


Figure 30. Images of DTMs before and after manual editing

The extent of the validation survey done by the Data Validation Component (DVC) in Agno to collect points with which the LiDAR dataset is validated is shown in Figure 31. A total of 7,139 control points were collected. The good correlation between the airborne LiDAR elevation values and the ground survey elevation values, which reflects the quality of the LiDAR DTM is shown in Figure 32. The computed RMSE between the LiDAR DTM and the surveyed elevation values is 10.952 centimeters with a standard deviation of 7.829 centimeters. The LE 90 value represents the linear vertical distance that 90% of the sampled DEM points and their respective DVC validation point counterparts should be found from each other. Other statistical information can be found in Table 15. The final DTM and extent of the bathymetric survey done along the river is shown in Figure 33.

Results and Discussion

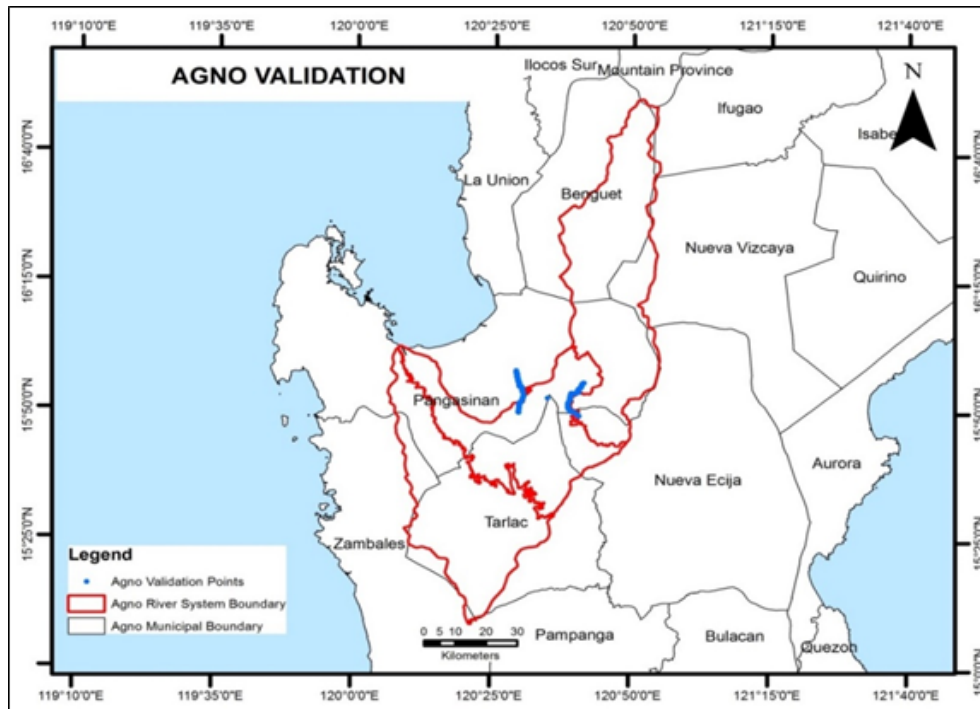


Figure 31. Map of Agno River System with validation survey shown in blue

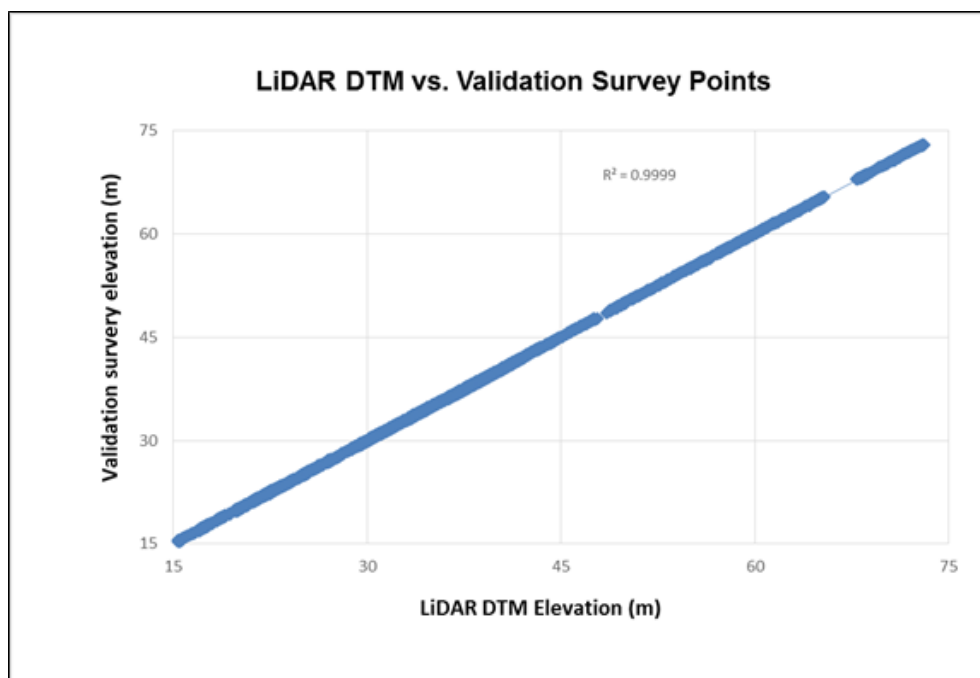


Figure 32. One-one Correlation plot between topographic and LiDAR data

Results and Discussion

Table 15. Statistical values for the calibration of flights

Statistical Information	Values (cm)
Min	7.828
Max	7.829
RMSE	-15.559
Standard Deviation	15.742
LE90	12.795

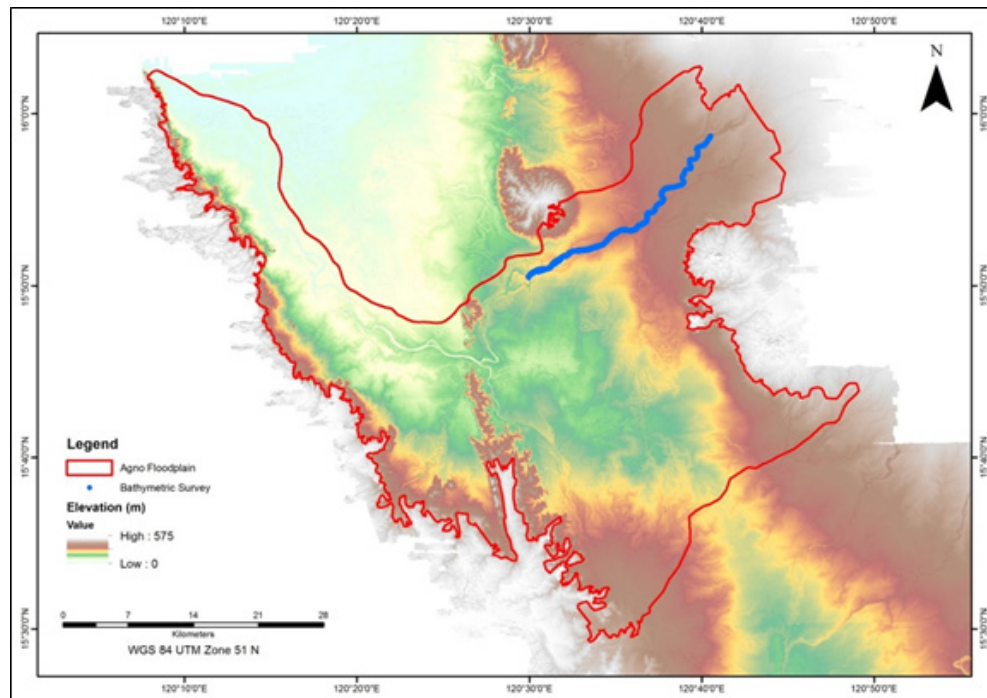


Figure 33. Final DTM of Agno with validation survey shown in blue

The floodplain extent for Davao is also presented, showing the completeness of the LiDAR dataset and DSM produced, is shown in Figure 34. Samples of 1 kilometer by 1 kilometer of DSM and DTM are shown in Figure 35 and Figure 36, respectively.

Results and Discussion

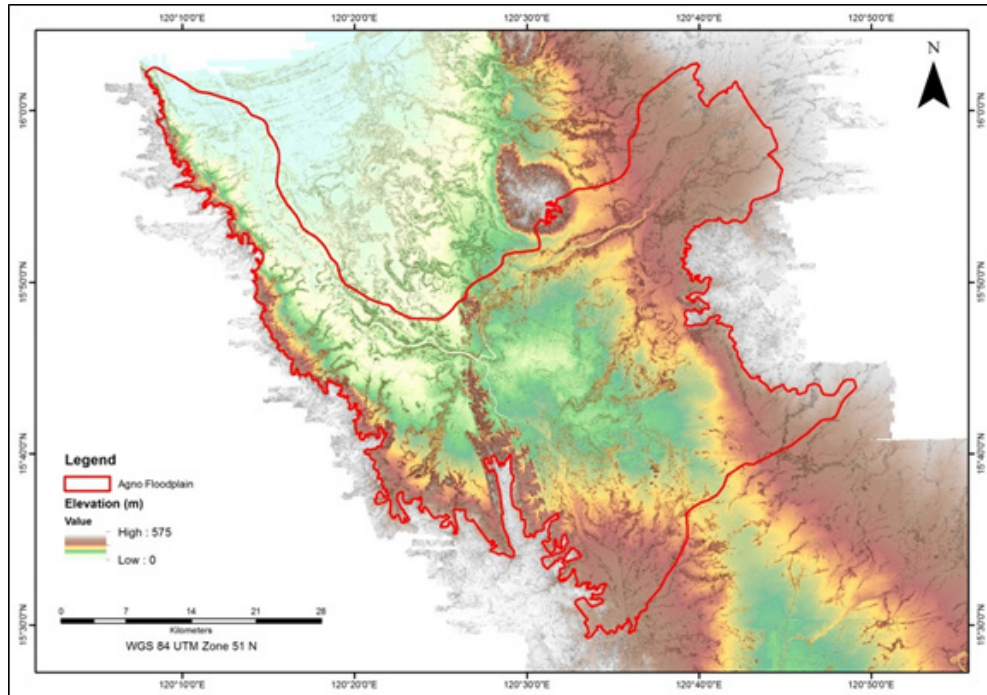


Figure 34. Final DSM in Agno

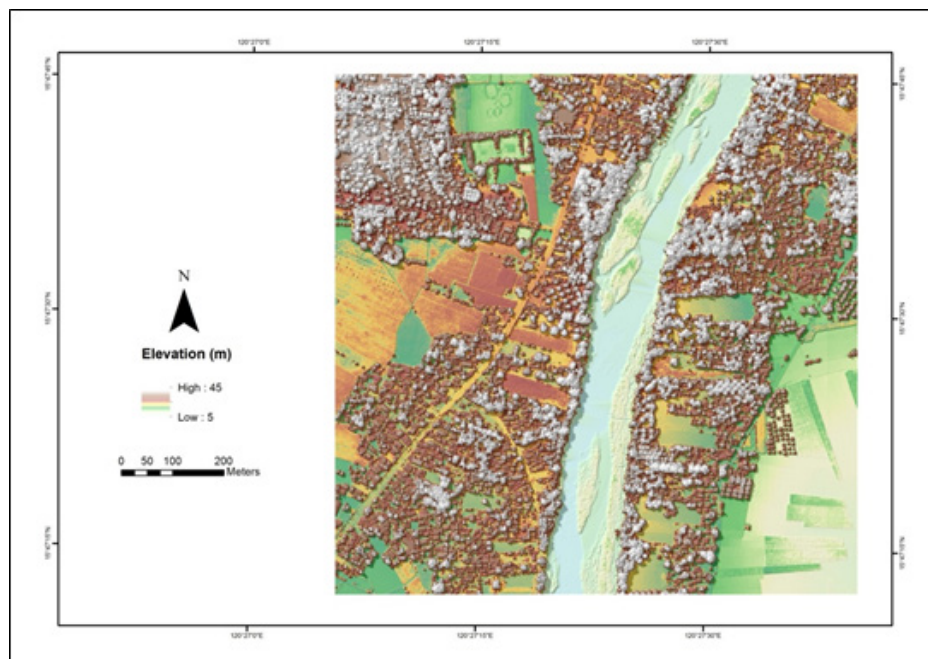


Figure 35. Sample 1x1 square kilometer DSM

Results and Discussion

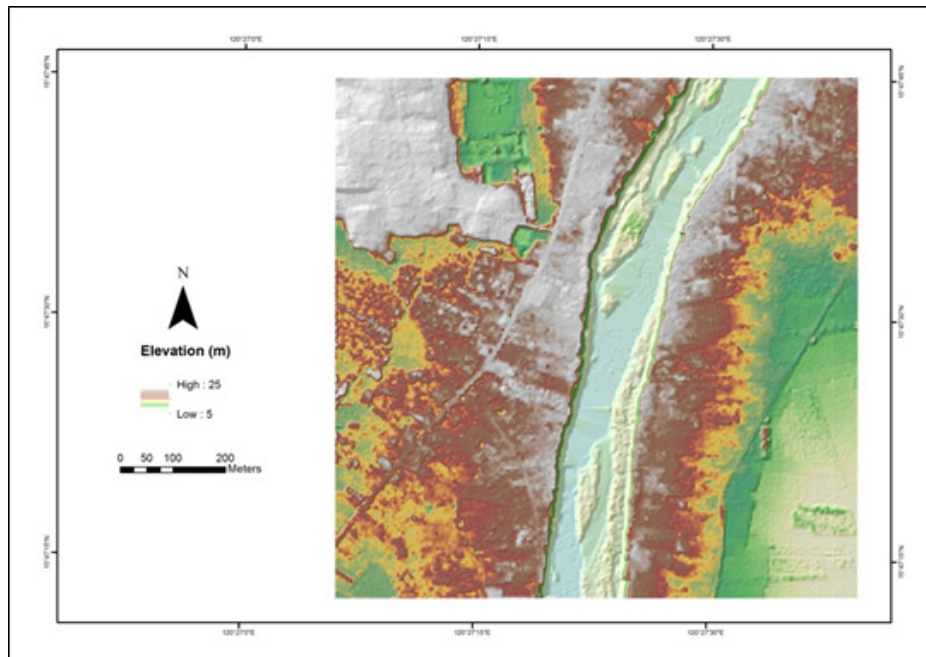


Figure 36. Sample 1x1 square kilometer DTM

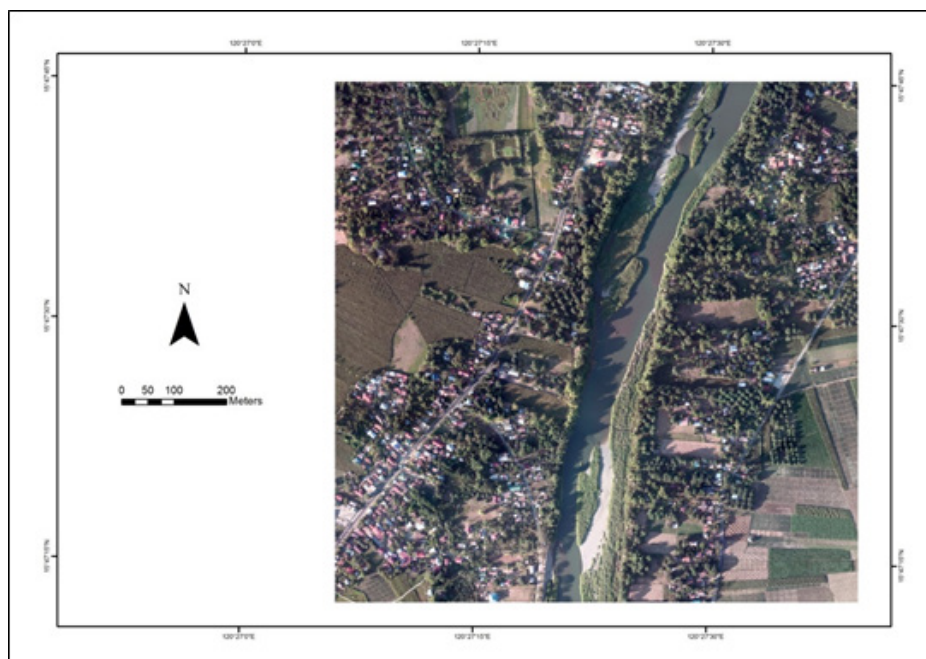


Figure 37. Sample 1x1 kilometer Orthophoto

Annexes



Annex A

OPTECH TECHNICAL SPECIFICATIONS OF THE PEGASUS SENSOR

Parameter	Specification
Operational envelope (1,2,3,4)	150-5000 m AGL, nominal
Laser wavelength	1064 nm
Horizontal accuracy (2)	1/5,500 x altitude, 1 σ
Elevation accuracy (2)	< 5-20 cm, 1 σ
Effective laser repetition rate	Programmable, 100-500 kHz
Position and orientation system	POS AV™ AP50 (OEM)
Scan width (FOV)	Programmable, 0-75 °
Scan frequency (5)	Programmable, 0-140 Hz (effective)
Sensor scan product	800 maximum
Beam divergence	0.25 mrad (1/e)
Roll compensation	Programmable, $\pm 37^\circ$ (FOV dependent)
Vertical target separation distance	<0.7 m
Range capture	Up to 4 range measurements, including 1st, 2nd, 3rd, and last returns
Intensity capture	Up to 4 intensity returns for each pulse, including last (12 bit)
Image capture	5 MP interline camera (standard); 60 MP full frame (optional)
Full waveform capture	12-bit Optech IWD-2 Intelligent Waveform Digitizer
Data storage	Removable solid state disk SSD (SATA II)
Power requirements	28 V, 800 W, 30 A
Dimensions and weight	Sensor: 630 x 540 x 450 mm; 65 kg; Control rack: 650 x 590 x 490 mm; 46 kg
Operating Temperature	-10°C to +35°C
Relative humidity	0-95% non-condensing



Annex B

OPTECH TECHNICAL SPECIFICATIONS OF THE D-8900 AERIAL DIGITAL CAMERA

Parameter	Specification
Camera Head	
Sensor type	60 Mpix full frame CCD, RGB
Sensor format (H x V)	8, 984 x 6, 732 pixels
Pixel size	6µm x 6 µm
Frame rate	1 frame/2 sec.
FMC	Electro-mechanical, driven by piezo technology (patented)
Shutter	Electro-mechanical iris mechanism 1/125 to 1/500++ sec. f-stops: 5.6, 8, 11, 16
Lenses	50 mm/70 mm/120 mm/210 mm
Filter	Color and near-infrared removable filters
Dimensions (H x W x D)	200 x 150 x 120 mm (70 mm lens)
Weight	~4.5 kg (70 mm lens)
Controller Unit	
Computer	Mini-ITX RoHS-compliant small-form-factor embedded computers with AMD Turion™ 64 X2 CPU 4 GB RAM, 4 GB flash disk local storage IEEE 1394 Firewire interface
Removable storage unit	~500 GB solid state drives, 8,000 images
Power consumption	~8 A, 168 W
Dimensions	2U full rack; 88 x 448 x 493 mm
Weight	~15 kg
Image Pre-Processing Software	
Capture One	Radiometric control and format conversion, TIFF or JPEG
Image output	8,984 x 6,732 pixels or 16 bits per channel (180 MB or 360 MB per image)

Annex C

THE SURVEY TEAM

Data Acquisition Component			
Sub-team	Designation	Name	Agency/Affiliation
Data Acquisition Component Leader	Data Component Project Leader –I	ENGR. CZAR JAKIRI S. SARMIENTO	UP-TCAGP
Survey Supervisor	Chief Science Research Specialist (CSRS)	ENGR. CHRISTOPHER CRUZ	UP TCAGP
LiDAR Operation	Supervising Science Research Specialist (Supervising SRS)	LOVELY GRACIA ACUNA	UP TCAGP
LiDAR Operation	Senior Science Research Specialist (SSRS)	MARK GREGORY ANO	
	UP TCAGP		
LiDAR Operation	Senior Science Research Specialist (SSRS)	JASMINE ALVIAR	UP TCAGP
Ground Survey	Senior Science Research Specialist (SSRS)	ENGR. GEROME HIPOLITO	UP TCAGP
Ground Survey	Research Associate	ENGR. JAMES WILBERT BELTRAN	UP TCAGP
Data Download and Transfer	Research Associate	CHRISTOPHER JOAQUIN	UP TCAGP
LiDAR Operation	Airborne Security	SSG. SOBERANO	Philippine Air Force (PAF)
LiDAR Operation	Pilot	FRANCISCO CADENAS	ASIAN AEROSPACE CORP (AAC)
LiDAR Operation	Pilot	JAMAAL CLEMENTE	AAC
LiDAR Operation	Co-pilot	LAWRENCE MADAYAG	AAC
LiDAR Operation	Co-pilot	GRAIUS DELA CRUZ	AAC
LiDAR Operation	Co-pilot	FRANCO JESUS PEPITO	AAC



NAMRIA CERTIFICATION TRC-1



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

May 10, 2013

CERTIFICATION

To whom it may concern:

This is to certify that according to the records on file in this office, the requested survey information is as follows -

Province: TARLAC	Station Name: TRC-1	Order: 1st	Barangay: SAN ROQUE
Island: LUZON	Municipality: TARLAC	PRS92 Coordinates	
Latitude: 15° 28' 44.13765"	Longitude: 120° 35' 52.67202"	Ellipsoidal Hgt: 46.89100 m.	
WGS84 Coordinates			
Latitude: 15° 28' 38.48550"	Longitude: 120° 35' 57.49329"	Ellipsoidal Hgt: 86.90220 m.	
PTM Coordinates			
Northing: 1711833.357 m.	Easting: 456859.89 m.	Zone: 3	
UTM Coordinates			
Northing: 1,712,636.20	Easting: 242,278.30	Zone: 51	

Location Description

TRC-1

Is located in a NIA irrigation canal concrete floodgate 300 m. E of the natl. highway, 1.5 km. SE of Tarlac town proper. From Manila, travel along MacArthur Highway to Tarlac. A small bridge, 10 m. NW of Sombrero Food Center along the irrigation canal bank to the railroad. It is 2 m. W of the railroad on the eastern floodgate wall, which is 5 min. walk from highway. Mark is a 0.15 m. x 0.01 m. dia. brass rod set on a drilled hole in a standard concrete block with cement putty, 0.03 m. above the top of the concrete railing, inscribed with station name. Reference marks (RM): RM's 1, 2 & 3 are 0.15 m. x 0.01 m. dia. brass rods set in a drilled hole with cement putties. RM-2 is a 0.15 m. x 0.01 m. dia. brass rod set on concrete block, 0.6 m. below ground level; Sub-RM is a 0.15 m. x 0.01 m. dia. brass rod set on a drilled hole on top of the concrete railing.

Requesting Party: **Christopher Cruz**
Purpose: **Reference**
OR Number: **3943636B**
T.N.: **2013-0420**


RUEL D.M. BELEN, MNSA
Director, Mapping and Geodesy Department



NAMRIA OFFICES:

Main : Lawton Avenue, Fort Bonifacio, 1634 Taguig City, Philippines Tel. No.: (632) 810-4831 to 41
Branch : 421 Barraca St. San Nicolas, 1010 Manila, Philippines, Tel. No. (632) 241-3494 to 98
www.namria.gov.ph



NAMRIA CERTIFICATION PNG-56



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

April 18, 2013

CERTIFICATION

To whom it may concern:

This is to certify that according to the records on file in this office, the requested survey information is as follows -

Island: LUZON	Province: PANGASINAN	
Municipality: STO. TOMAS	Station Name: PNG-56	
	Order: 2nd	Barangay: POBLACION
PRS92 Coordinates		
Latitude: 15° 52' 46.68500"	Longitude: 120° 34' 54.80152"	Ellipsoidal Hgt: 30.68000 m.
WGS84 Coordinates		
Latitude: 15° 52' 40.94082"	Longitude: 120° 34' 59.58898"	Ellipsoidal Hgt: 69.45900 m.
PTM Coordinates		
Northing: 1756173.446 m.	Easting: 455222.371 m.	Zone: 3
UTM Coordinates		
Northing: 1,757,009.80	Easting: 241,058.87	Zone: 51

Location Description

PNG-56

From Urdaneta, travel S until reaching Villasis then pass the Carmen Bridge. Then turn right until reaching Sto. Tomas Mun. Hall, about 2 km. from the intersection of Brgy. Carmen. Station is located in the town plaza fronting the mun. hall. It is situated 8.6 m. from the NE column of the waiting shed and 8.2 m. from the S entrance road. Mark is a 30 cm. x 30 cm. x 1 m. concrete monument, with inscriptions "PNG-56 2007 NAMRIA".

Requesting Party: **UP DREAM/ Melchor Nery**
Purpose: **Reference**
OR Number: **3943540 B**
T.N.: **2013-0309**

RUEL DM. BELEN, MNSA
Director, Mapping and Geodesy Department



NAMRIA OFFICES:
Main : Lawton Avenue, Fort Bonifacio, 1634 Taguig City, Philippines Tel. No.: (632) 810-4831 to 41
Branch : 421 Barraca St. San Nicolas, 1010 Manila, Philippines. Tel. No. (632) 241-3494 to 98
www.namria.gov.ph



NAMRIA CERTIFICATION PNG-3235



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

May 10, 2013

CERTIFICATION

To whom it may concern:

This is to certify that according to the records on file in this office, the requested survey information is as follows -

Province: PANGASINAN		
Station Name: PNG-3235		
Order: 4th		Barangay: MAPINIT
Island: LUZON		
Municipality: SAN CARLOS CITY		
PRS92 Coordinates		
Latitude: 15° 54' 53.39177"	Longitude: 120° 22' 37.60736"	Ellipsoidal Hgt: 14.36100 m.
WGS84 Coordinates		
Latitude: 15° 54' 47.62346"	Longitude: 120° 22' 42.39285"	Ellipsoidal Hgt: 52.53700 m.
PTM Coordinates		
Northing: 1760122.49 m.	Easting: 433302.82 m.	Zone: 3
UTM Coordinates		
Northing: 1,761,170.53	Easting: 219,166.89	Zone: 51

Location Description

PNG-3235

To reach the station travel 10-20 minutes eastward routing to Malasiqui beginning at San Carlos city proper. Turn right after reaching the junction going to Brgy. Mapinit. The station is located near the barangay hall. It is about 15 m E of the said hall and 3 m W from the centerline of the road. Station mark is the head of a 4" copper nail on a 0.40 m x 0.40 m concrete monument with inscription PNG-3235, PRS-92, 2008, DENR-LMS R-1.

Requesting Party: **Christopher Cruz**
Pupose: **Reference**
OR Number: **3943636B**
T.N.: **2013-0419**


RUEL M. BELEN, MNSA
Director, Mapping and Geodesy Department



NAMRIA OFFICES:

Main : Lawton Avenue, Fort Bonifacio, 1634 Taguig City, Philippines Tel. No.: (632) 810-4831 to 41
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www.namria.gov.ph



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheets for 1AGN10338A and AGN10

Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION
29-Nov-2012 029	JAMES NOVILLA	PAM 8A PART 1	ARAYAT	PEGASUS	2.54 GB	1.14 MB	185 MB	43.3 GB		14 GB	98.1 GB	MULTIPLE BASE	\\Freenas\DAC\from_DPC_Hard_Drive\DAC\Date\11292012\Flight Number\029
30-Nov-2012 030	JAMES NOVILLA	PAM 8A PART 2	ARAYAT	PEGASUS	0.98 GB	599 KB	104 MB	15.6 GB		7.59 GB	32.4 GB	MULTIPLE BASE	\\Freenas\DAC\from_DPC_Hard_Drive\DAC\Date\11302012\Flight Number\030
30-Nov-2012 031	IRO ROXAS	LMS CALIBRATION 3	ARAYAT	PEGASUS	921 MB	638 KB	99.2 MB	16.2 GB		6.78 GB	26 GB	27.2 MB	\\Freenas\DAC\from_DPC_Hard_Drive\CALIBRATION\flight\LMS\Pegasus113012
1-Dec-2012 032	IRO ROXAS	PAM 8B	PAMPANGA	PEGASUS	2.95 GB	1.48 MB	211 MB			25.1 GB			\\Freenas\DAC\from_DPC_Hard_Drive\DAC\Date\12012012\Flight Number\032
3-Dec-2012 033	LOVELY ACUÑA	AGN10 1AGN10338A	TARLAC	PEGASUS	1 GB	471 KB	126 MB	11.3 GB	95 KB	8.73 GB	23.7 GB	2.059 MB	E:\12032012\33\1AGN10338A
3-Dec-2012 034	CHRISTOPHER CRUZ	AGN10		PEGASUS	1.03 GB	954 KB	154 MB			8.36 GB		4.78 MB	E:\12032012\34\AGN10 PEGASUS
6-Dec-2012 035	CHRISTOPHER CRUZ	1P8C3342A	BULACAN	PEGASUS									
7-Dec-2012 036	LOVELY ACUÑA	AQUARIUS ZTH CALIBRATION	BINALONA	AQUARIUS									
7-Dec-2012 037	JAMES NOVILLA	ZTH CALIBRATION	BINALONA	GEMINI									
8-Dec-2012 038	LOVELY ACUÑA	LMS CALIBRATION / CAMERA	TARLAC	GEMINI									
8-Dec-2012 039	IRO ROXAS	CALIBRATION	TARLAC	GEMINI									
10-Dec-2012 040	LOVELY ACUÑA	2P8C345A	BULACAN	GEMINI	N/A	941 KB	265 MB	57.6 GB		17.7 GB	88 GB	AAC-OK FMC-PMG-	FREENAS\RAW\ PAMPANGA E:\1202012_BASE_PA\040G

Handwritten signature

NO DATA. OVERCAST CLOUDS

DATA ARE STORED IN MS. DIMOG'S PC AND USB.

FLIGHT ABORTED DUE TO RAIN.

Page 4 of 5



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheets for 1AGN10338A and AGN10

Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS DATA	POS MB	RAW IMAGES	MISSION LOG FILE	RANGE GB	DIGITIZER	BASE STATION	SERVER LOCATION	STATION
10-Dec-2012	JAMES NOVILLA	2P8C345B	BULACAN (PLARIDEL)	GEMINI	N/A	NO DATA	124 MB		NO DATA. SYSTEM ERROR.				E:\12102012\BASE PA\041G\12p8c345b	FREENAS\ RAW\ PAMPANGA
11-Dec-2012	JAMES NOVILLA	2P8D346A	BULACAN (PLARIDEL)	GEMINI	N/A	861 KB	312 MB	17 GB		104 GB		AAC-OK FMC-OK PMG-OK	\\Freenas\dac\Raw\Pampanga\12112012\Gemini\2p8c346a\BASE AND IMAGE	FREENAS\ RAW\ PAMPANGA
11-Dec-2012	CHRISTOPHER CRUZ	1P8D346A	BULACAN (PLARIDEL)	PEGASUS	1.67 GB	1.13 MB	164 MB	13.8 GB				AAC-OK FMC-OK PMG-OK	E:\12112012\Pegasus\1P8D346A	FREENAS\ RAW\ PAMPANGA
11-Dec-2012	GREGORY ANO	Test Flight	BULACAN (PLARIDEL)	PEGASUS										
NOT YET DOWNLOADED. WITH SYSTEM ERROR.														

RECEIVED FROM: MILLIE SHANE REYES
 NAME: SSRS
 POSITION: SSRS

SIGNATURE: [Signature]
 DATE TRANSFERRED: 12/12/12

RECEIVED BY: SHANE CANALAN
 NAME: SSRS
 POSITION: SSRS

SIGNATURE: [Signature]
 DATE TRANSFERRED: 12/12/12

VERIFIED BY: _____
 NAME: _____
 POSITION: _____
 SIGNATURE: _____
 DATE TRANSFERRED: _____

[Handwritten Signature]

Page 5 of 5



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN10G1010A, 1A10E10A, 2AGN10G210B, 1A10F10B, 2AGN10I2011A and 1A10H11A

Date	Flig ht No.	Operator	Mission Name	Description (loc)	Sensor	RAW LAS	LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZ ER	BASE STATION	SERVER LOCATION
9/Jan/2013	084	Iro Neil Roxas	2P7F2009B	Bataan	GEMINI	N/A	924 KB	217 MB	24.1 GB	6 KB / 169 KB / 38 KB	11.9 GB	51.8 GB	7.26 MB	(PC21) C:\Dream\84G
10/Jan/2013	085	Iro Neil Roxas	2AGN10G1010A	Tarlac	GEMINI	N/A	706 KB	231 MB	47.1 GB	359 KB	12 GB	59.3 GB	AAC - 4.09 MB / TRC - 6.69 MB	(PC21) C:\Dream\85G
10/Jan/2013	086	Jasmine Alviar	1A10E10A	Tarlac	PEGASUS	3.26 GB	1.60 MB	245 MB	72.7 GB	531 KB	31.9 GB	58.8 GB	AAC - 4.09 MB / TRC - 6.69 MB	(PC22) G:\86P
10/Jan/2013	087	James Albert Novilla	2AGN10G210B	Tarlac	GEMINI	N/A	648 KB	212 MB			11.4 GB	81.4 GB	AAC - 4.09 MB / TRC - 6.69 MB	(PC21) G:\87G
10/Jan/2013	088	Mark Gregory Año	1A10F10B	Pampanga	PEGASUS	2.31 GB	1.09 MB	152 MB	37.5 GB	332 KB	17.6 GB	93.7 GB	AAC - 4.09 MB / TRC - 6.69 MB	(PC21) G:88P and (PC22) G:\88P
11/Jan/2013	089	Lovely Acuña	2AGN10I2011A	Tarlac	GEMINI	N/A	824 KB	282 MB	51.4 GB	437 KB	15.8 GB	124 GB	AAC - 4.99 MB / TRC - 5.36 MB	(PC21) E:\New Transfer\01112013\89G abd (PC22) G:\89G
11/Jan/2013	090	Mark Gregory Año	1A10H11A	Pangasinan	PEGASUS	846 MB	125 KB	156 MB	37 GB	238 KB / 78 KB	15.2 GB	79.8 GB	AAC - 4.99 MB / TRC - 5.36 MB	(PC21) G:\90P

RECEIVED FROM: LOVELY ACUNA
 NAME: JRP
 POSITION: JRP
 SIGNATURE: [Signature]
 DATE TRANSFERRED: 11/13/13

RECEIVED BY: Sarah Jane Samalbas
 NAME: SJS
 POSITION: SJS
 SIGNATURE: [Signature]
 DATE TRANSFERRED: 11/13/13

* * *



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AG6P021A, 2AGO021B and AGNO12A

Sheet 1

DATA TRANSFER SHEET (SUITE1)																
FLIGHT NO.	OPERATOR	MISSION NAME (LOC)	DESCRIPTION	SENSOR	RAW LAS	LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATIONS	OPERATOR COMMENTS (OPC LOSS)	FLIGHT PLAN	MODEM SERIAL NO.	SERVER LOCATION
Jan 16, 2013 095	Avery Maira	1D018B - TEST	DAVAO FLOODPLAIN	PEGASUS	40.4 MB	215 MB	51.3 MB	814 MB	R32 bytes	3.05 GB	11.4 GB	TEST: 1.80 MB	OK	OK	AC0013	\\fzpsan1\data\095
Jan 17, 2013 094	Jeanne Abur	1D0017B	DAVAO FLOODPLAIN	PEGASUS	304 MB	1.79 MB	200 MB	59.2 GB	566 KB	32.3 GB	154 GB	DVS-1: 9.61 MB	OK	OK	AC0013	\\fzpsan1\data\094
Jan 18, 2013 096	Mark Underz Abur	1C0018A	COMPOSTELA VALLEY	PEGASUS	201 MB	1.69 MB	290 MB	74 GB	552 KB	16.2 GB	84 GB	DVS-1: 8.45 MB DVS-2: 10.7 MB CYMBAWAO: 19.7 MB	OK	OK	AC0013	\\fzpsan1\data\096
Jan 18, 2013 096	Jeanne Abur	1D0018B	DAVAO FLOODPLAIN	PEGASUS	175 MB	272 KB	140 MB	28.5 GB	318 KB	18.6 GB	49.6 GB	DVS-1: 8.45 MB DVS-2: 10.7 MB CYMBAWAO: 19.7 MB	OK	OK	AC0013	\\fzpsan1\data\096
Jan 21, 2013 097	Roan No Nal	2AG6P021A	PANGASINAN	GEMINI	N/A	803 KB	470 MB	10.8 GB / 1.02 GB	378 MB / 608 KB	15.1 GB	102 GB	5.79 MB	OK	OK	ENGG_CRU	\\fzpsan1\data\097
Jan 21, 2013 098	Lovely Rose	2AG0021B	PANGASINAN	GEMINI	N/A	714 KB	178 MB	44.8 GB	377 KB	17.3 GB	No data	5.79 MB	OK	OK	ENGG_CRU	\\fzpsan1\data\098
Jan 22, 2013 099	Roan	AGNO12A	PANGASINAN	GEMINI	N/A	855 KB	208 MB	58.4 GB	808 KB	14.6 GB	No data	2.87 MB	OK	OK	ENGG	\\fzpsan1\data\099

Received from:
 Name: Patricia Alcantara
 Position: EA
 Signature: *[Signature]*
 Data Transferred: 2/23/13

Received by: Joida F. Prieto
 Name:
 Position: SSRS
 Signature: *[Signature]*
 Data Transferred: 01/23/2013

Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AG023A, 2AGL023B, AGN6L024A, 2AGN6L025A and 2AGNGJ026B

DATA TRANSFER FILE CHECKLIST
JANUARY 26, 2012

Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION
16/Jan/2013	Aubrey Matira	1D0168 - TEST	DAVAO FLOODPLAIN	PEGASUS	40.4 MB	215 KB	51.3 MB	NO IMAGE DATA (TEST IMAGES ONLY: 81.4 MB)	832 bytes	3.05 GB	11.4 GB	TEST: 1.80 MB	\\FREENAS\DAC\93P
17/Jan/2013	Jasmine Alviar	1DV0178	DAVAO FLOODPLAIN	PEGASUS	304 MB	1.79 MB	206 MB	59.2 GB	566 KB	32.3 GB	154 GB	DVS-1: 9.61 MB	\\FREENAS\DAC\94P
18/Jan/2013	Mark Gregory Afo	1CV018A	COMPOSTELA VALLEY	PEGASUS	201 MB	1.69 MB	250 MB	74 GB	552 KB	16.2 GB	84 GB	DVS-1: 8.45 MB DVC-BASE- CV&DAVAO: 10.7MB	\\FREENAS\DAC\95P
18/Jan/2013	Jasmine Alviar	1DV018B	DAVAO FLOODPLAIN	PEGASUS	175 MB	678 KB	140 MB	26.9 GB	318 KB	18.6 GB	49.6 GB	DVS-1: 8.45 MB DVC-BASE- CV&DAVAO: 10.7MB	\\FREENAS\DAC\96P
23/Jan/2013	Jasmine Alviar	1NB023A	New Bataan	PEGASUS	290 MB	566K	98.8 MB	27.6GB	199KB	14.0G B	33.8GB	DVS-1: 6.82MB	\\FREENAS\DAC\101P
23/Jan/2013	Lovely Acuna	2AG023A	Pangasinan	GEMINI	732 KB	209 MB		38.3 GB	56.2 KB / 262 KB / 3.52 KB / 70 KB	12.6 GB	10.5 GB	PNG56 - 102 B	\\FREENAS\DAC\100G
23/Jan/2013	Iro Neil Roxas	2AGL023B	Pangasinan	GEMINI	N/A	469 KB	144 MB	30.4 GB	247 KB	8.05 GB	NO DIGITIZER	PNG56 - 102 B	\\FREENAS\DAC\102G
24/Jan/2013	Lovely Acuna	2AGN6L024A	Pangasinan	GEMINI	N/A	452 KB	131 MB	31.8 GB	240 KB	7.93 GB	NO DIGITIZER	PNG56 - 102 B	\\FREENAS\DAC\103G
25/Jan/2013	Lovely Acuna	2AGN6L025A	Pangasinan	GEMINI	N/A	998 KB	246 MB	63.8 GB	531 KB	17.3 GB	NO DIGITIZER	PNG56 - 102 B	\\FREENAS\DAC\105G
26/Jan/2013	Iro Neil Roxas	2AGNGJ026B	Pangasinan	GEMINI	N/A	658 KB	179 MB	39.2 GB	325 KB	9.59 GB	NO DIGITIZER	PNG 56 L.462m	\\FREENAS\DAC\109G

RECEIVED BY: _____

NAME: Josely F. Paredes

POSITION: SSRS

SIGNATURE: _____

DATE TRANSFERRED: 01/26/2013





Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN6C0

DATE	FLIGHT NO.	OPERATOR	MISSION NAME	MISSION DESCRIPTION (LOC)	SENSOR LAS	RAW LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION(S)	OPERATOR COMMENTS (DPC LOGS)	FLIGHT PLAN	HARDWARE LOCATION	SERVER LOCATION
Jan 26, 2013 107P		Jasmine Alviar	1DV028A	DAVAO FLOODPLAIN	PEGASUS 92.9 MB	798 KB	129 MB	62.1 GB	450 KB	13.3 GB	42.9 GB	DVS-1: 7.53MB		OK	DVC:DATA ACQUISITION COMPONENTDAG LIDAR DATA2013 FLIGHTS01282013107P1	
Jan 26, 2013 108P		Mark Gregory Airo	Mission at													
Jan 27, 2013			Mission C1													
Jan 28, 2013 111P		Mark Gregory Airo	1CV028A	COMPOSTELA VALLEY/NEW BATAAN	PEGASUS 51.2 MB	1.12 MB	190 MB	35.2 GB	282 KB	9.45 GB	51.7 GB	DVS-1: 8.80MB; COMPOSTELA: 7.63 MB AND 3.24 MB; NEW BATAAN: 1.66 MB		OK	DVC:DATA ACQUISITION COMPONENTDAG LIDAR DATA2013 FLIGHTS01282013111P1	
Jan 28, 2013 113P		Jasmine Alviar	1CV025B	COMPOSTELA VALLEY/NEW BATAAN	PEGASUS 162 MB	1.17 MB	174 MB	57.1 GB	697 KB	26.7 GB	112 GB	DVS-1: 8.80MB; COMPOSTELA: 7.63 MB AND 3.24 MB; NEW BATAAN: 1.66 MB		OK	DVC:DATA ACQUISITION COMPONENTDAG LIDAR DATA2013 FLIGHTS01282013113P1	
Feb 2, 2013 120G		Ito Niel Roxas	2AGN6C0	PANGASINAN	GEMINI N/A	632 KB	247 MB	31.6 GB	263 KB	17.2 GB	no data		OK		E:DATA ACQUISITION COMPONENT V02022013 - \Freesas\id	

Transferred by:	Received by:
Name: <u>Carl Nolas</u>	Name: <u>Joida Prieto</u>
Position: <u>DA</u>	Position: <u>SRS</u>
Signature: 	Signature: 
	Date: <u>02/04/13</u>
Verified by:	
Name: _____	
Position: _____	
Signature: _____	



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN6I028A, 2AGN6H028B, 2AGN6G029A and 2AGN6F029B

DATA TRANSFER FILE CHECKLIST
JANUARY 30, 2012

Date	Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION
28/jan/2013	110	Iro Neil Roxas	2AGN6I028A	Pangasinan	GEMINI	720 KB	191 MB	48.1 GB	13 KB/ 334 KB	12.1 GB	NO DIGITIZER	7.3 MB	(PC 22) C:\TRANSFERRED\110G
28/jan/2013	112	Lovely Acuna	2AGN6H028B	Pangasinan	GEMINI	N/A	725 KB	192 MB	47.6 GB	12.8 GB	NO DIGITIZER	7.3 MB	(PC 22) C:\TRANSFERRED\112G
29/jan/2013	114	Iro Neil Roxas	2AGN6G029A	Pangasinan	GEMINI	783 KB	206 MB	55.3 GB	396 KB/ 1 KB/ 5 KB	12.9 GB	NO DIGITIZER	12.1 MB	(PC 22) C:\TRANSFERRED\114G
29/jan/2013	116	Lovely Acuna	2AGN6F029B	Pangasinan	GEMINI	N/A	529 KB	196 MB	27.7 GB	12.6 GB	NO DIGITIZER	12.1 MB	(PC 22) C:\TRANSFERRED\116G

RECEIVED FROM: <u>Caric Jorquin</u> NAME: <u>Caric Jorquin</u> POSITION: <u>RESEARCH ASSOCIATE</u>	RECEIVED BY: <u>aida F. Pineda</u> NAME: <u>aida F. Pineda</u> POSITION: <u>SSS</u>
SIGNATURE: <u>[Signature]</u> DATE TRANSFERRED: <u>01/30/2013</u>	SIGNATURE: <u>[Signature]</u> DATE TRANSFERRED: <u>01/30/2013</u>



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN6E030A and 2AGN6D030B

DATA TRANSFER FILE CHECKLIST
JANUARY 31, 2012

Date	Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION	
30/Jan/2013	117	Iro Neil Roxas	2AGN6E030A	Tarlac	GEMINI	N/A	514 KB	178 MB	26.6 GB	207 KB	12.4 GB	NO DIGITIZER	11.7 MB	\\FREENAS\DAC\117G
30/Jan/2013	118	Lovely Acuna	2AGN6D030B	Tarlac	GEMINI	N/A	451 KB	179 MB	22.6 GB	12. KB/170 KB	11.9 GB	NO DIGITIZER	11.7 MB	\\FREENAS\DAC\118G

RECEIVED FROM: _____ NAME: <u>CHRISTOPHER JACUIN</u> POSITION: <u>PA</u>	RECEIVED BY: _____ NAME: <u>JULIA F. PRIETO</u> POSITION: <u>SRS</u>
SIGNATURE: <u>[Signature]</u> DATE TRANSFERRED: <u>3/3/13</u>	SIGNATURE: <u>[Signature]</u> DATE TRANSFERRED: <u>03/31/2013</u>



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN6A036A, 1AGN5M036A, 2AGN5O036B, 2AGN5E037A, 1AGN5L037A, 2AGN5D037B and 1AGN5J040A

DATA TRANSFER FILE CHECKLIST February 05, 2013														
Date	Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS	POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION
05/feb/13	126		2AGN6A036A		GEMINI	N/A	453 KB	164 MB	20.5 GB	149 KB	12.1 GB	NO DIGITIZER	14.2 MB	\\FREENAS\DAC\02062013\02052013\126
05/feb/13	127		1AGN5M036A		PEGASUS	191 MB	926 KB	126 MB	28 GB	216 KB	16.1 GB	79.9 GB	11.3 MB	\\FREENAS\DAC\02062013\02052013\127
05/feb/13	128		2AGN5O036B		GEMINI	N/A	394 KB	154 MB	19.7 GB	171 KB	9.57 GB	NO DIGITIZER	11.3 MB	\\FREENAS\DAC\02062013\02052013\128
06/feb/13	129		2AGN5E037A		GEMINI	N/A	611 KB	184 MB	20.5 GB	-	10.5 GB	NO DIGITIZER	6.21 MB	\\FREENAS\DAC\02062013\129G
06/feb/13	130		1AGN5L037A		PEGASUS	104 MB	1.35 MB	153 MB	33 GB	44KB/2 10KB	GB/1 2.9 GB	64.7 GB	6.21 MB	\\FREENAS\DAC\02062013\130P
06/feb/13	131		2AGN5D037B		GEMINI	N/A	515 KB	159 MB	43.8 GB	133KB/ 6KB/3K B/25KB	9.67 GB	NO DIGITIZER	6.21 MB	\\FREENAS\DAC\02062013\131G
09/feb/13	136		1AGN5J040A		PEGASUS	104 MB	757 KB	124 MB	26.1 GB	208 KB	325 MB	82.8 GB		\\FREENAS\DAC\136P 136

RECEIVED FROM:	RECEIVED BY:
NAME: <u>CARLOS PACE JOAQUIN</u>	NAME: <u>Jaida F. Prieto</u>
POSITION: <u>PA</u>	POSITION: <u>SIS</u>
SIGNATURE: <u>[Signature]</u>	SIGNATURE: <u>[Signature]</u>
DATE TRANSFERRED: <u>FEB 11, 2013</u>	DATE TRANSFERRED: <u>02/11/2013</u>



Annex E

DATA TRANSFER SHEET FOR AGNO FLOODPLAIN

Data Transfer Sheet for 2AGN6B035A, 1AGN5P035B, 2AGN6B035A and 2AGN5N035B

DATA TRANSFER FILE CHECKLIST
February 08, 2013

Date	Flight No.	Operator	Mission Name	Description (Loc)	Sensor	RAW LAS	LOGS POS	RAW IMAGES	MISSION LOG FILE	RANGE	DIGITIZER	BASE STATION	SERVER LOCATION	
04/feb/2013	122	Iro Neil Roxas	2AGN6B035A	PANGASINAN	GEMINI	N/A	445 KB	182 MB	23.5 GB	188 KB	11.7 GB	NO DIGITIZER	8.59 MB	\\FREEMASIDAC\122G
04/feb/2013	124	Jasmine Alviar	1AGN5P035B	PANGASINAN	PEGASUS	150 MB	714 KB	110 MB	-	1 KB	16.3 GB	74.2 GB	8.59 MB	\\FREEMASIDAC\124P
04/feb/2013	125	Lovely Acuna	2AGN6B035A 5N035B	PANGASINAN	GEMINI	N/A	332 KB	126 MB	16.5 GB	1KB/14 GB	7.17 GB	NO DIGITIZER	8.59 MB	\\FREEMASIDAC\125G

<p>RECEIVED FROM: <u>CHRISTOPHER JORDAN</u></p> <p>NAME: <u>Joseph F. Pineda</u></p> <p>POSITION: <u>SRS</u></p> <p>SIGNATURE: <u>[Signature]</u></p> <p>DATE TRANSFERRED: <u>02/08/2013</u></p>	<p>RECEIVED BY: _____</p> <p>NAME: _____</p> <p>POSITION: _____</p> <p>SIGNATURE: _____</p> <p>DATE TRANSFERRED: _____</p>
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Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6M023A Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 100	
1 Lidar Operator: <u>Jourly Anisa</u>	2 ALTM Model: <u>Levini</u>	3 Mission Name: <u>AGNO</u>	4 Type: VFR	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>R-09122</u>		
7 Pilot: <u>Cpt. Codenos</u>	8 Co-Pilot: <u>J. Clemente</u>	9 Route: <u>Clark - Pangasinan</u>					
10 Date: <u>01/23/2013</u>	11 Airport of Departure: <u>Clark / Binalona</u>	12 Airport of Arrival: <u>Clark / Binalona</u>					
13 Engine On: <u>0909 H</u>	14 Engine Off: <u>1250 H</u>	15 Total Engine Time: <u>343 HRS</u>	16 Take off: <u>0920 H</u>	17 Landing: <u>1209 H</u>	18 Total Flight Time: <u>3m 19s</u>		
19 Weather: <u>good weather</u>							
20 Remarks: <u>All lines surveyed except line 1, 82 (AGNO)</u>							
- <u>line c in (AGNO) → finished</u>							
- <u>Atte to survey out the tie line</u>							
- <u>fuel constraint</u>							
21 Problems and Solutions:							
→ digitizer (DDA) initializes but hang at about the end of line c (AGNO)							
→ best connection with POS because of that, restarted the system and do in-air realignment							
→ I didn't finish line 182							
→ operator recommended not to use digitizer until there is an update from Optech Services							
Acquisition Flight Approved by <u>LOE UT GRADA ACUNA</u> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <u>Sgt. PASCAL D. SORIANO PAF</u> Signature over Printed Name (PAF Representative)		Pilot-in-Command <u>F. ANISA</u> Signature over Printed Name		Lidar Operator <u>LOE UT GRADA ACUNA</u> Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6L023B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 102	
1 LIDAR Operator: <i>PA 20113</i>	2 ALTM Model: <i>Agno</i>	3 Mission Name: <i>AGNO</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cessna T206H</i>	6 Aircraft Identification: <i>F7-1712</i>
7 Pilot: <i>F. CHABREUIL</i>	8 Co-Pilot: <i>J. CLEMENTE</i>	9 Route: <i>CJA - PAN/SAINT-JAN - CJA</i>	10 Date: <i>23 JAN 13</i>	11 Airport of Arrival (Airport, City/Province): <i>CJA</i>	12 Airport of Departure (Airport, City/Province): <i>CJA</i>
13 Engine On: <i>17:30H</i>	14 Engine Off: <i>17:50H</i>	15 Total Engine Time: <i>3h 10m</i>	16 Take off: <i>15:53</i>	17 Landing: <i>16:03</i>	18 Total Flight Time: <i>30m</i> <i>1h 21m</i> <i>3m</i>
19 Weather: <i>Clear</i>	20 Remarks: <i>Successful</i> <i>No Disturb</i> <i>+ lines 13 2 of AGN 6M</i> <i>Not finished: 2, 3, 4, 5, 6</i>				
21 Problems and Solutions:					
Acquisition Flight Approved by <i>Joseph -</i> JOSEPH ACQUAIA Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <i>[Signature]</i> Sydney D. Brown Signature over Printed Name (PAF Representative)		Pilot-in-Command <i>[Signature]</i> F. CHABREUIL Signature over Printed Name	
Acquisition Flight Approved by <i>[Signature]</i> J. P. 20113 Signature over Printed Name		Lidar Operator <i>[Signature]</i> J. P. 20113 Signature over Printed Name		DREAM Disaster Risk Exposure and Assessment for Mitigation	

Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6L024A Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 103	
1 LIDAR Operator: <u>180 PETAAS</u>	2 ALTM Model: <u>GENA</u>	3 Mission Name: <u>ZAGNOA</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cesna T206H</u>	6 Aircraft Identification: <u>PP-0142</u>		
7 Pilot: <u>F. CARDEWIS</u>	8 Co-Pilot: <u>J. CUBIENNE</u>	9 Route: <u>CH - BURBANCK - CH</u>	12 Airport of Arrival (Airport, City/Province): <u>CIA</u>				
10 Date: <u>24 JAN 13</u>	12 Airport of Departure (Airport, City/Province): <u>CIA</u>		16 Take off: <u>08:14</u>	17 Landing: <u>16:05</u>	18 Total Flight Time: <u>1h 13m 30s</u>		
13 Engine On: <u>07:54</u>	14 Engine Off: <u>07:54</u>	15 Total Engine Time: <u>2h 57m</u>					
19 Weather: <u>Clear</u>							
20 Remarks: <ul style="list-style-type: none"> • No signature • Lines 8, 6, 4, 2, 3 • missed line 5, operator has an error 							
21 Problems and Solutions:							
Acquisition Flight Approved by		Acquisition Flight Certified by		Pilot-in-Command		Lidar Operator	
<u>[Signature]</u>		<u>[Signature]</u>		<u>[Signature]</u>		<u>[Signature]</u>	
Signature over Printed Name (End User Representative)		Signature over Printed Name (PAF Representative)		Signature over Printed Name		Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6K025A Mission

DREAM Data Acquisition Flight Log										Flight Log No.: 105		
1 LIDAR Operator: <i>Lorely Acuña</i>	2 ALTM Model: <i>Genial</i>	3 Mission Name: <i>2AGN6K025A</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cessna T206H</i>	6 Aircraft Identification: <i>RP-C9122</i>	7 Pilot: <i>Capt. F. Cordones</i>	8 Co-Pilot: <i>J. Clemente</i>	9 Route: <i>Clark to Pasay</i>	10 Date: <i>6/25/2013</i>	11 Airport of Arrival (Airport, City/Province): <i>Clark</i>	12 Total Flight Time: <i>30 mins</i>	
13 Engine On: <i>0852 H</i>	14 Engine Off: <i>1255 H</i>	15 Total Engine Time: <i>4:03</i>	16 Take off: <i>0935 H</i>	17 Landing: <i>1208 H</i>	18 Total Flight Time: <i>30 mins</i>	19 Weather: <i>1208 H</i>	20 Remarks: <i>Completed the survey mission. i) - No digital data</i>					
21 Problems and Solutions: <i>No problem.</i>												

Acquisition Flight Approved by <i>Lorely Acuña</i> Signature over Printed Name (End User Representative)	Acquisition Certified by <i>Sy Deseo Salazar</i> Signature over Printed Name (PAF Representative)	Pilot-in-Command Signature over Printed Name	Lidar Operator <i>Lorely Acuña</i> Signature over Printed Name
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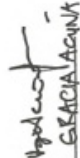


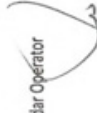



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6J026B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 109	
1 LIDAR Operator: <u>180 PAFS</u>	2 ALTM Model: <u>68M</u>	3 Mission Name: <u>AGNO B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>P-C9192</u>
7 Pilot: <u>F. CAPRANZI</u>	8 Co-Pilot: <u>F. CAPRANZI</u>	9 Route: <u>CA - BIANZONI - CA</u>	12 Airport of Arrival (Airport, City/Province): <u>CA</u>		
10 Date: <u>26 Jun 13</u>	12 Airport of Departure (Airport, City/Province): <u>CA</u>		16 Take off: <u>09:04</u>	17 Landing: <u>10:45</u>	18 Total Flight Time: <u>1h 41m</u>
13 Engine On: <u>17:04</u>	14 Engine Off: <u>17:07</u>	15 Total Engine Time: <u>2m 38m</u>	19 Weather: <u>Slightly Cloudy</u>		
20 Remarks: <u>No digitizer</u> <u>unable to finish line 3, slight underdevelopment fuel constraints</u> <u>probe was disconnected early in the flight, restricted</u>					
21 Problems and Solutions:					

Acquisition Flight Approved by  LORENZO GRACIA AGUIRRE Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  S. J. S. S. S. Signature over Printed Name (PAF Representative)	Pilot-in-Command  F. CAPRANZI Signature over Printed Name	Lidar Operator  PAF Signature over Printed Name
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DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2GN6I028A + AGN6Jline3

DREAM Data Acquisition Flight Log						Flight Log No.: 110
1 LIDAR Operator: <u>Rob Kovacs</u>	2 ALTM Model: <u>Gemini</u>	3 Mission Name: <u>AGNOI028A</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>BP-C0122</u>	
7 Pilot: <u>Capt. F. Cardenas</u>	8 Co-Pilot: <u>F. Poyto</u>	9 Route: <u>Clark - Prunavision</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>			
10 Date: <u>01/29/2018</u>	11 Airport of Departure (Airport, City/Province): <u>Clark</u>	13 Total Engine Time: <u>3+35</u>	14 Engine Off: <u>1235H</u>	15 Take off: <u>0915H</u>	16 Landing: <u>12:50H</u>	
13 Engine On: <u>0900H</u>	14 Engine Off: <u>1235H</u>	15 Total Engine Time: <u>3+35</u>	16 Take off: <u>0915H</u>	17 Landing: <u>12:50H</u>	18 Total Flight Time: <u>3+15</u>	
19 Weather: <u>Good</u>	20 Remarks: <ul style="list-style-type: none"> • No piggyback • No line 7 • + AGJ line 3 					
21 Problems and Solutions:						

Acquisition Flight Approved by

[Signature]
 LORETTA GARCIA ACOSTA
 Signature over Printed Name
 (End User Representative)

Acquisition Flight Certified by


[Signature]
 SYDNEY SOBERNO PAF
 Signature over Printed Name
 (PAF Representative)

Pilot-in-Command

[Signature]
 F. CARDENAS
 Signature over Printed Name

Lidar Operator

[Signature]
 JESUS RODRIGUEZ
 Signature over Printed Name



DREAM
 Disaster Risk Exposure and Assessment for Mitigation


Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6H028B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 112	
1 LIDAR Operator: <u>LARRY ACUNA</u>	2 ALTM Model: <u>OTUMI</u>	3 Mission Name: <u>2AGN6H028B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>PR-0922</u>
7 Pilot: <u>CAF + cadang</u>	8 Co-Pilot: <u>F. Peps</u>	9 Route: <u>Clark - Pangasinan</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>		
10 Date: <u>9/28/2013</u>	11 Airport of Departure (Airport, City/Province): <u>Clark</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>	13 Engine On: <u>1410 H</u>	14 Engine Off: <u>1730 H</u>	15 Total Engine Time: <u>2928</u>
16 Take off: <u>14:20H</u>	17 Landing: <u>1730H</u>	18 Total Flight Time: <u>3+10</u>	19 Weather: <u>Good weather</u>		
20 Remarks: <u>Successful Survey</u> <u>No digital data</u> <u>Missed LMC 5</u>					
21 Problems and Solutions:					

Acquisition Flight Approved by <u>LARRY ACUNA ACUNA</u> Signature over Printed Name (End User Representative)	Acquisition Flight Certified by <u>Sgt. Dioniso Sabano PAF</u> Signature over Printed Name (PAF Representative)	Pilot-in-Command <u>F. Peps</u> Signature over Printed Name	Lidar Operator <u>LARRY ACUNA ACUNA</u> Signature over Printed Name
--	--	---	---



DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6G029A + AGNGHline5 Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 114	
1 LIDAR Operator: <i>PA PAYS</i>	2 ALTM Model: <i>GBM</i>	3 Mission Name: <i>2AGN6G029A</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cesna T206H</i>	6 Aircraft Identification: <i>P7-1972</i>		
7 Pilot: <i>P. CHABONIS</i>	8 Co-Pilot: <i>F. PÉTIOT</i>	9 Route: <i>CLPAC - PAN (P) - CHT</i>	12 Airport of Arrival (Airport, City/Province): <i>CHT</i>				
10 Date: <i>20 Jan '13</i>	12 Airport of Departure (Airport, City/Province): <i>CHT</i>		16 Take off: <i>0910H</i>	17 Landing: <i>1255H</i>	18 Total Flight Time: <i>3+25</i>		
13 Engine On: <i>0900H</i>	14 Engine Off: <i>0940H</i>	15 Total Engine Time: <i>3+40</i>					
19 Weather: <i>Good</i>							
20 Remarks: <i>+ A6H line 5 , Success (M) , No danger</i>							
21 Problems and Solutions: <i>, Manque en rumeur dans ang lunch</i>							
Acquisition Flight Approved by <i>Yves LAMBERT ACQUINA</i> Signature over Printed Name (End User Representative)		Acquisition Certified by <i>Sgt DISCORSO D. Sobetans PAF</i> Signature over Printed Name (PAF Representative)		Pilot-in-Command <i>F. CHABONIS</i> Signature over Printed Name		Lidar Operator <i>PA PAYS</i> Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6F029B Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 116
1 LIDAR Operator: <u>Lorely Acuña</u>	2 ALTM Model: <u>Gemini</u>	3 Mission Name: <u>2AGN6F</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Casenna T206H</u>	6 Aircraft Identification: <u>44-59122</u>	
7 Pilot: <u>Capt. F. Cadanos</u>	8 Co-Pilot: <u>F. Pept</u>	9 Route: <u>Clark to Pangasinan</u>				
10 Date: <u>01/22/2013</u>	11 Airport of Departure (Airport, City/Province): <u>CIH</u>	12 Airport of Arrival (Airport, City/Province): <u>CIH</u>				
13 Engine On: <u>1400H</u>	14 Engine Off: <u>1730H</u>	15 Total Engine Time: <u>2H30</u>	16 Take off: <u>1410H</u>	17 Landing: <u>1725H</u>	18 Total Flight Time: <u>2H15</u>	
19 Weather: <u>Good</u>						
20 Remarks: <u>Successful/finished all lines</u>						
21 Problems and Solutions: <u>planning missing pna camera / requested drops</u>						
Acquisition Flight Approved by <u>Lorely Acuña</u> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <u>Sgt. Doreen D. Soriano PAF</u> Signature over Printed Name (PAF Representative)		Pilot-in-Command <u>F. Pept</u> Signature over Printed Name		
Lidar Operator <u>Lorely Acuña</u> Signature over Printed Name						




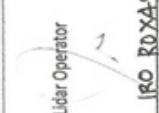


Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6E030A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 117	
1 LIDAR Operator: 120 ROXAS	2 ALTM Model: Gemini	3 Mission Name: 2AGN6E030A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: R4-C922
7 Pilot: Cpt. F. Condor	8 Co-Pilot: Cpt. F. Papat	9 Route: Clark to Pangasinan			
10 Date: 01/30/2019	12 Airport of Departure (Airport, City/Province): Clark	12 Airport of Arrival (Airport, City/Province): Clark			
13 Engine On: 0850H	14 Engine Off: 1230H	15 Total Engine Time: 345	16 Take off: 0855	17 Landing: 1230H	18 Total Flight Time: 345
19 Weather: Good					
20 Remarks: Successful flight					
21 Problems and Solutions:					

Acquisition Flight Approved by  Loret Acuña Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Sig. Disodoro D. Sobocan PAF Signature over Printed Name (PAF Representative)	Pilot-in-Command  F. Condor Signature over Printed Name	Lidar Operator  IRO ROXAS Signature over Printed Name
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Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6D030B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 118	
1 LIDAR Operator: <u>LARRY ACUNA</u>	2 ALTM Model: <u>Gemini</u>	3 Mission Name: <u>2AGN6D030B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>P-0822</u>
7 Pilot: <u>Capt. F. Cadenas</u>	8 Co-Pilot: <u>Capt. F. Repto</u>	9 Route: <u>Clark → Pangasinan</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>		
10 Date: <u>09/30/2013</u>	12 Airport of Departure (Airport, City/Province): <u>Clark</u>		15 Total Engine Time: <u>315</u>	16 Take off: <u>1430H</u>	17 Landing: <u>1730H</u>
13 Engine On: <u>1425H</u>	14 Engine Off: <u>1740 H</u>	18 Total Flight Time: <u>3105</u>			
19 Weather: <u>Good</u>					
20 Remarks: <u>Successful flight</u> <u>Missed line 4 / Late start bec. of refuel / Need to be full-tank</u>					
21 Problems and Solutions: <u>On line 1 → half of line didn't have images bec. of missing PMS data. So I restarted DiOps.</u>					
Acquisition Flight Approved by <u>LARRY ACUNA</u> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <u>Sgt. Disson D. Suberana PAF</u> Signature over Printed Name (PAF Representative)		Pilot-in-Command <u>F. CADENAS</u> Signature over Printed Name	
Lidar Operator <u>LARRY ACUNA</u> Signature over Printed Name					



DREAM



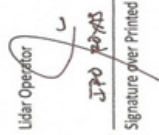
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6C033B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 122	
1 LIDAR Operator: JPO PAXAS	2 ALTM Model: 6EVA	3 Mission Name: 2AGN6C033B	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: P-C112
7 Pilot: F-CAPRINA	8 Co-Pilot: F-PBTTB	9 Route: CA - PAXAS - CA	12 Airport of Arrival (Airport, City/Province): CA		
10 Date: 04 FEB 18	12 Airport of Departure (Airport, City/Province): CA		16 Take off: 090H	17 Landing: 1059	18 Total Flight Time: 3+46
13 Engine On: 0904H	14 Engine Off: 1004H	15 Total Engine Time: 4+10	19 Weather: Clear		
20 Remarks: <ul style="list-style-type: none"> • K lang • + AGN6 C 4, 8 (in the line) 					
21 Problems and Solutions:					
Acquisition Flight Approved by		Acquisition Flight Certified by		Lidar Operator	
 Signature over Printed Name (End User Representative)		 Signature over Printed Name (PAF Representative)		 Signature over Printed Name Lidar Operator	



DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6B035A Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 123	
1 LIDAR Operator: IRO RDXAS	2 ALTM Model: Gemini	3 Mission Name: 246N6B	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: gp- C0122		
7 Pilot: Capt. F. Coctenas	8 Co-Pilot: Grants de la Cruz	9 Route: Clark → Pangasinan Tarlac	12 Airport of Arrival (Airport, City/Province): Clark				
10 Date: 02/04/2013	11 Airport of Departure (Airport, City/Province): Clark	15 Total Engine Time: 3130	16 Take off: 1040H	17 Landing: 1300H	18 Total Flight Time: 3110H		
13 Engine On: 1025H	14 Engine Off: 1355H	19 Weather: Good					
20 Remarks: missed line 6							
21 Problems and Solutions:							
Acquisition Flight Approved by <i>Christopher Cruz</i> Christopher Cruz Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <i>Sy Dioso Sotolow</i> Sy Dioso Sotolow Signature over Printed Name (PAF Representative)		Pilot-in-Command <i>F. Coctenas</i> F. Coctenas Signature over Printed Name		Lidar Operator <i>IRO RDXAS</i> IRO RDXAS Signature over Printed Name	



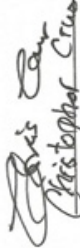

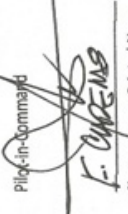
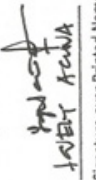
DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5N035B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 125	
1 LIDAR Operator: Lacey Acuña	2 ALTM Model: Gemini	3 Mission Name: 2AGN5N 035B	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: RP-C9122
7 Pilot: Capt. F. Cadenas	8 Co-Pilot: 6. de la Cruz	9 Route: Clark → Pangasinan	12 Airport of Arrival (Airport, City/Province): Clark		
10 Date: 02/04/2013	12 Airport of Departure (Airport, City/Province): Clark	15 Total Engine Time: 3h 250H	16 Take off: 1800H	17 Landing: 1755H	18 Total Flight Time: 2h30
13 Engine On: 1510H	14 Engine Off: 1800H	19 Weather: -Good			
20 Remarks: Successful Missed wire 283					
21 Problems and Solutions: IMU failure at the start / Restored the system					
Acquisition Flight Approved by  Christopher Cruz Signature over Printed Name (End User Representative)		Acquisition Flight Certified by  Sgt. Prospero Soropano PAF Signature over Printed Name (PAF Representative)		Pilot-in-Command  F. CADENAS Signature over Printed Name	
				Udar Operator  LACEY ACUÑA Signature over Printed Name	



DREAM



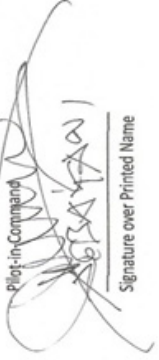

Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5P035B Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 124
1 LIDAR Operator: J. Alvarez	2 ALTM Model:	3 Mission Name: 1A5P035B	4 Type: VFR	5 Aircraft Type: Casna T206H	6 Aircraft Identification: RP-C9022	
7 Pilot: R. Agbayani	8 Co-Pilot: J. Clemente	9 Route: Clark-Bimboman-Agu	12 Airport of Arrival (Airport, City/Province): Clark			
10 Date: 9 Feb 2013	12 Airport of Departure (Airport, City/Province): Clark		16 Take off: 1515H	17 Landing: 1415H	18 Total Flight Time: 3+0	
13 Engine On: 1500H	14 Engine Off: 1830H	15 Total Engine Time: 3+30				
19 Weather: clear						
20 Remarks: completed but w/o camera data (did not trigger as planned)						
21 Problems and Solutions: * camera was not triggering - changed plan, checked camera settings						
Acquisition Flight Approved by  Signature over Printed Name (End User Representative)		Acquisition Flight Certified by  Signature over Printed Name (PAF Representative)		Pilot-in-Command  Signature over Printed Name		
				Lidar Operator  Signature over Printed Name		




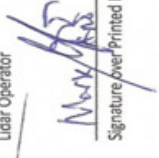


Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5M036A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 127	
1 LIDAR Operator: <u>Victor Abo</u>	2 ALTM Model: <u>Pepper</u>	3 Mission Name: <u>ASMSCB</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cas nna T206H</u>	6 Aircraft Identification: <u>EP-19022</u>
7 Pilot: <u>Angel Lopez</u>	8 Co-Pilot: <u>Juan Carlos</u>	9 Route: <u>Clark to San Jose</u>	10 Date: <u>05 Feb 2013</u>	11 Airport of Arrival (Airport, City/Province): <u>Clark</u>	12 Airport of Departure (Airport, City/Province): <u>Clark</u>
13 Engine On: <u>1355</u>	14 Engine Off: <u>1750</u>	15 Total Engine Time: <u>3:55</u>	16 Take off: <u>1355</u>	17 Landing: <u>1645</u>	18 Total Flight Time: <u>1:45</u>
19 Weather: <u>Clear</u>					
20 Remarks: <u>Survey - ok.</u>					
21 Problems and Solutions:					

Acquisition Flight Approved by  Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Signature over Printed Name (PAF Representative)	Pilot-in-Command  Signature over Printed Name	Lidar Operator  Signature over Printed Name
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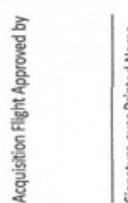
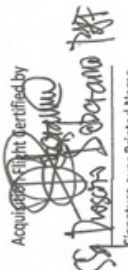



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6A036A + AGN6Bline6 Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 126	
1 LIDAR Operator: IRO ROXAS	2 ALTM Model: Gemini	3 Mission Name: 2AGN6A 036A	4 Type: VFR	5 Aircraft Type: Casnna T206H	6 Aircraft Identification: PP-C0122
7 Pilot: Capt. F. Codenas	8 Co-Pilot: G. de la Cruz	9 Route: Clark to Pagadian	10 Date: 02/05/2013	11 Airport of Departure (Airport, City/Province): Clark	12 Airport of Arrival (Airport, City/Province): Clark
13 Engine On: 0915H	14 Engine Off: 1325H	15 Total Engine Time: 410	16 Take off: 0921H	17 Landing: 1311H	18 Total Flight Time: 3195
19 Weather: Good					
20 Remarks:	<p>Continued AGN6B line 6</p> <p>Missed 4, 5, 6</p>				
21 Problems and Solutions:					

Acquisition Flight Approved by	Acquisition Flight Verified by	Lidar Operator
		
Signature over Printed Name (End User Representative)	Signature over Printed Name (PAF Representative)	Signature over Printed Name
	Sgt. Diosda Soriano PAF	IRO ROXAS



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5O036B Mission

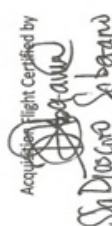
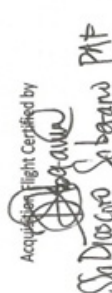
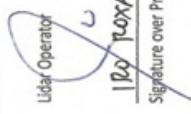

DREAM Data Acquisition Flight Log				Flight Log No.: 128	
1 LIDAR Operator: <u>Ledy Acuna</u>	2 ALTM Model: <u>Gomivi</u>	3 Mission Name: <u>2AGN5O</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Ces nna T206H</u>	6 Aircraft Identification: <u>PR-09122</u>
7 Pilot: <u>Cpt. F. Cadenas</u>	8 Co-Pilot: <u>G. de la Cruz</u>	9 Route: <u>Clark to Pangasinan</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>		
10 Date: <u>02/05/2013</u>	12 Airport of Departure (Airport, City/Province): <u>Clark</u>		16 Take off: <u>1515H</u>	17 Landing: <u>1955H</u>	18 Total Flight Time: <u>2+40H</u>
13 Engine On: <u>1500H</u>	14 Engine Off: <u>1800H</u>	15 Total Engine Time: <u>3+00</u>	19 Weather: <u>Good</u>		
20 Remarks: <u>AK V line 31, line 428</u>					
21 Problems and Solutions:					
Acquisition Flight Approved by	Acquisition Flight Certified by	Pilot-in-Command	Lidar Operator		
<u>Sgt. Doreen Soropano PAF</u>	<u>[Signature]</u>	<u>[Signature]</u>	<u>[Signature]</u>		
Signature over Printed Name (End User Representative)	Signature over Printed Name (PAF Representative)	Signature over Printed Name	Signature over Printed Name		



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2A5E037A Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 129
1 LIDAR Operator: <u>110 B04AS</u>	2 ALTM Model: <u>Gemini</u>	3 Mission Name: <u>2AGNSE037A</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>RP-C9122</u>	
7 Pilot: <u>Capt. F. Calanog</u>	8 Co-Pilot: <u>G. dela Cruz</u>	9 Route: <u>Clark - Pangasinan</u>				
10 Date: <u>12/06/2013</u>	11 Airport of Departure (Airport, City/Province): <u>Clark</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>				
13 Engine On: <u>0900H</u>	14 Engine Off: <u>1230H</u>	15 Total Engine Time: <u>3+30</u>	16 Take off: <u>0920H</u>	17 Landing: <u>1220H</u>	18 Total Flight Time: <u>3+00</u>	
19 Weather: <u>Good</u>						
20 Remarks:	<p>✓ ok, successful</p> <p>✓ maintaining area to the west</p>					
21 Problems and Solutions:						
Acquisition Flight Approved by		Acquisition Flight Certified by		Lidar Operator		
 Signature over Printed Name (End User Representative)		 Signature over Printed Name (PAF Representative)		 Signature over Printed Name		
		 Signature over Printed Name				



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5D037B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 131			
1 LIDAR Operator: <u>Lovely Abania</u>	2 ALTM Model: <u>Garmin</u>	3 Mission Name: <u>2AGN5D037B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Casna T206H</u>	6 Aircraft Identification: <u>P-C 0122</u>		
7 Pilot: <u>Capt. F. Codrens</u>	8 Co-Pilot: <u>G-dela Cruz</u>	9 Route: <u>Clark - Pangasinan</u>	10 Date: <u>02/06/2013</u>	11 Airport of Arrival (Airport, City/Province): <u>Clark</u>			
12 Airport of Departure (Airport, City/Province): <u>Clark</u>	13 Engine On: <u>1440 H</u>	14 Engine Off: <u>1700 H</u>	15 Total Engine Time: <u>310</u>	16 Take off: <u>1500 H</u>	17 Landing: <u>1745 H</u>		
18 Total Flight Time: <u>2145</u>	19 Weather: <u>Good</u>	20 Remarks: <u>Restarted flights (Missing FMS data)</u> <u>Missed Line 2 & Line 4</u> <u>2nd line on (Line 4) test mission folder</u>					
21 Problems and Solutions:							

Acquisition Flight Approved by _____ Signature over Printed Name (End User Representative)	Acquisition Flight Certified by _____ Signature over Printed Name (PAF Representative)	Pilot-in-Command _____ <u>F. Codrens</u> Signature over Printed Name	Lidar Operator _____ <u>JARUT ACUNA</u> Signature over Printed Name
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Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5L037B Mission

DREAM Data Acquisition Flight Log		170		Flight Log No. 170	
1 LIDAR Operator: <u>Nick Aio</u>	2 ALTM Model: <u>Leica</u>	3 Mission Name: <u>1A5L037B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cesna T206H</u>	6 Aircraft Identification: <u>RP-0902</u>
7 Pilot: <u>Ashley</u>	8 Co-Pilot: <u>Jessica</u>	9 Route: <u>Clark to Bulaan</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>		
10 Date: <u>05 Feb 2015</u>	11 Airport of Departure (Airport, City/Province): <u>Clark</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>	15 Total Engine Time: <u>4:08</u>	16 Take off: <u>14:24</u>	17 Landing: <u>18:20</u>
13 Engine On: <u>10:30</u>	14 Engine Off: <u>14:24</u>	15 Total Engine Time: <u>4:08</u>	16 Take off: <u>14:24</u>	17 Landing: <u>18:20</u>	18 Total Flight Time: <u>3:20</u>
19 Weather					
20 Remarks: <u>Survey - Ok.</u>					
21 Problems and Solutions:					
Acquisition Flight Approved by <u>Nick Aio</u> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by _____ Signature over Printed Name (PAF Representative)		Lidar Operator <u>Nick Aio</u> Signature over Printed Name	
		Pilot-in-Command _____ Signature over Printed Name			



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5F038A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 132	
1 Lidar Operator: <i>IPo Foxys</i>	2 ALTM Model: <i>EDM</i>	3 Mission Name: <i>245668A</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cessna T206H</i>	6 Aircraft Identification: <i>P209122</i>
7 Pilot: <i>P. CARROLL</i>	8 Co-Pilot: <i>E. J. DA CUNHA</i>	9 Route: <i>Clit - PAF16</i>	12 Airport of Arrival (Airport, City/Province): <i>Clit</i>		
10 Date: <i>07 Feb 13</i>	12 Airport of Departure (Airport, City/Province): <i>Clit</i>		16 Take off: <i>10:24</i>	17 Landing: <i>12:24</i>	18 Total Flight Time: <i>2:16</i>
13 Engine On: <i>09:54</i>	14 Engine Off: <i>13:11</i>	15 Total Engine Time: <i>3:34</i>			
19 Weather: <i>Slighty hazy</i>					
20 Remarks:	<p><i>- elk (avg =)</i></p> <p><i>- mentions area to the west</i></p>				
21 Problems and Solutions:					
<p>Acquisition Flight Approved by _____ Signature over Printed Name (End User Representative)</p> <p>Acquisition Flight Certified by <i>[Signature]</i> Signature over Printed Name (PAF Representative)</p> <p>Pilot-in-Command _____ Signature over Printed Name</p> <p>Lidar Operator <i>[Signature]</i> Signature over Printed Name <i>IPo Foxys</i></p>					

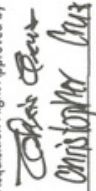

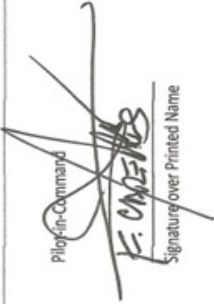




Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5C039A + AGN5Dlines2&4 Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 133	
1 Lidar Operator: F. BOYAS	2 ALTM Model: 60M	3 Mission Name: 4AS 039A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: N7922
7 Pilot: F. CAPELANS	8 Co-Pilot: G. DEBARAZZ	9 Route: C44 - 7000	12 Airport of Arrival (Airport, City/Province): C44		
10 Date: 08 FEB 15	12 Airport of Departure (Airport, City/Province): C44		15 Total Engine Time: 9+54	16 Take off: 0915H	17 Landing: 1230H
13 Engine On: 0901H	14 Engine Off: 1235H	18 Total Flight Time: 3+35		19 Weather	
20 Remarks: -ok . + ASD 1, 2					
21 Problems and Solutions:					

Acquisition Flight Approved by  Christopher Bus Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  S. D. Desnoes Signature over Printed Name (PAF Representative)	Pilot-in-Command  F. CAPELANS Signature over Printed Name	Lidar Operator  P. BOYAS Signature over Printed Name
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DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5B039B Mission



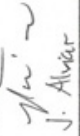
DREAM Data Acquisition Flight Log				Flight Log No.: 134	
1 LIDAR Operator: <u>LARRY ACUNA</u>	2 ALTM Model: <u>Gemini</u>	3 Mission Name: <u>2AGN5B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Cessna T206H</u>	6 Aircraft Identification: <u>C9122</u>
7 Pilot: <u>Capt. F. Codenos</u>	8 Co-Pilot: <u>G. de la Cruz</u>	9 Route: <u>Clark → Pangasinan</u>			
10 Date: <u>02/08/2013</u>	11 Airport of Departure (Airport, City/Province): <u>Clark</u>	12 Airport of Arrival (Airport, City/Province): <u>Clark</u>			
13 Engine On: <u>1430H</u>	14 Engine Off: <u>1750H</u>	15 Total Engine Time: <u>3+20</u>	16 Take off: <u>1440H</u>	17 Landing: <u>1745H</u>	18 Total Flight Time: <u>03+05</u>
19 Weather: <u>Good</u>					
20 Remarks: <u>Successful flight</u> <u>- finished all lines and a tie line</u>					
21 Problems and Solutions: <u>No problem except for the mountainous area in the west side of Survey Area</u>					
Acquisition Flight Approved by <u>Capt. F. Codenos</u> <u>MARIBONNE CHU</u> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <u>Sgt. Disobed Sabatano PAF</u> Signature over Printed Name (PAF Representative)		Lidar Operator <u>LARRY ACUNA</u> Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5K039A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 135	
1 LIDAR Operator: J. Alviar	2 ALTM Model: Pegasus 3	Mission Name: 1A5K039A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: RP-C9022
7 Pilot: A. Agbonyi	8 Co-Pilot: J. Crenshaw	9 Route: Clark - Binalonan - Agno - Binalonan - Clark	12 Airport of Arrival (Airport, City/Province): Clark	13 Engine On: 1452H	14 Engine Off: 1830H
10 Date: 08 Feb 2013	11 Airport of Departure (Airport, City/Province): Clark	15 Total Engine Time: 3+58	16 Take off: 1530H	17 Landing: 1835H	18 Total Flight Time: 2705
19 Weather: partly cloudy	20 Remarks: Mission completed except camera data (assertion failed)				
21 Problems and Solutions: camera assertion failed					
Acquisition Flight Approved by  Signature over Printed Name (End User Representative)		Acquisition Flight Certified by  Signature over Printed Name (PAF Representative)		Lidar Operator  Signature over Printed Name	



Disaster Risk Exposure and Assessment for Mitigation



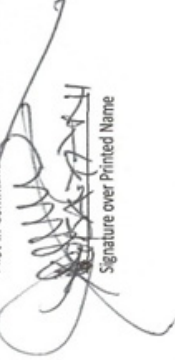
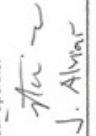



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5J40A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 136	
1 LIDAR Operator: J. Alvarez	2 ALTM Model: Pegasus	3 Mission Name: 1A5J40A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: RP-C9022
7 Pilot: A. Agbayani	8 Co-Pilot: J. Clemente	9 Route: Clark-Binalonan - Clark	12 Airport of Arrival (Airport, City/Province): Clark		
10 Date: 09 Feb 18	11 Airport of Departure (Airport, City/Province): Clark	15 Total Engine Time: 3+37	16 Take off: 1000H	17 Landing: 1300H	18 Total Flight Time: 2+40
13 Engine On: 1000H	14 Engine Off: 1337H	19 Weather: clear			
20 Remarks: mission completed					
21 Problems and Solutions:					

Acquisition Flight Approved by  Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Signature over Printed Name (PAF Representative)	Pilot-in-Command  Signature over Printed Name	Lidar Operator  Signature over Printed Name
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

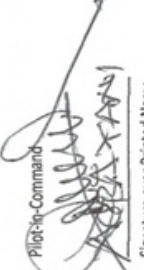

DREAM
Disaster Risk Exposure and Assessment for Mitigation


Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5I040B Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 137
1 LIDAR Operator: Christopher Cruz	2 ALTM Model: 700MS	3 Mission Name: 1A5I040B	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: PD 9022	
7 Pilot: Capt Christopher Cruz	8 Co-Pilot: Capt	9 Route: Clark - Dinaloman - Agno - Dinaloman - Clark	10 Date: Aug 9, 2013	12 Airport of Arrival (Airport, City/Province): Clark + Dinaloman	18 Total Flight Time:	
13 Engine On: 1450	14 Engine Off: 1830	15 Total Engine Time: 340	16 Take off: Clark	17 Landing: Dinaloman		
19 Weather: Fair						
20 Remarks: Done all lines						
21 Problems and Solutions:						

Acquisition Flight Approved by  Christopher Cruz Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Sgt. Rosendo Sarmiento PAF Signature over Printed Name (PAF Representative)	Pilot-in-Command  Christopher Cruz Signature over Printed Name	Lidar Operator  Christopher Cruz Signature over Printed Name
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DREAM
Disaster Risk Exposure and Assessment for Mitigation



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5H042A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 139	
1 LIDAR Operator: <i>Mark Anj</i>	2 ALTM Model: <i>CATC</i>	3 Mission Name: <i>1A5H042A</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cesna T206H</i>	6 Aircraft Identification: <i>EP-C9022</i>
7 Pilot: <i>Agustina</i>	8 Co-Pilot: <i>Clara</i>	9 Route: <i>Clark to Imling</i>	12 Airport of Arrival (Airport, City/Province): <i>Clark</i>		
10 Date: <i>11 Feb 2013</i>	12 Airport of Departure (Airport, City/Province): <i>Clark</i>	13 Engine On: <i>1005</i>	14 Engine Off: <i>124</i>	15 Total Engine Time: <i>243.347</i>	16 Take off: <i>1755</i>
17 Landing: <i>1424</i>	18 Total Flight Time: <i>245.4</i>	19 Weather: <i>clear</i>			
20 Remarks: <i>Mission aborted due to system error (digitalizer hang, FMI-NAV lost communication)</i>					
21 Problems and Solutions: <i>system error; report to optech.</i>					
Acquisition Flight Approved by <i>Mark Anj</i> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <i>SA Deseo Soriano PAF</i> Signature over Printed Name (PAF Representative)		Lidar Operator <i>Mark Anj</i> Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5G042A Mission

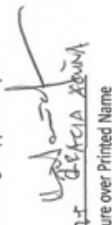

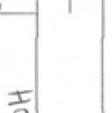
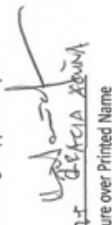

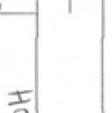
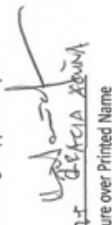

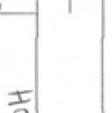
DREAM Data Acquisition Flight Log				Flight Log No.: 140	
1 LIDAR Operator: Mark Aho	2 ALTM Model: Pegasus	3 Mission Name: 1A5G042A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: 4P - cns 21
7 Pilot: A. Koyan	8 Co-Pilot: Clarence Clark	9 Route: Clark to Madras	12 Airport of Arrival (Airport, City/Province): Clark		
10 Date: Feb 2013	11 Airport of Departure (Airport, City/Province): Clark	15 Total Engine Time: 3+47	16 Take off:	17 Landing:	18 Total Flight Time:
13 Engine On: 1447	14 Engine Off: 1852				
19 Weather: clear					
20 Remarks: survey site: area underexposed.					
21 Problems and Solutions: - none (no digits)					
Acquisition Flight Approved by <i>Mark Aho</i> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by <i>Mark Aho</i> Signature over Printed Name (PAF Representative)		Pilot-in-Command Signature over Printed Name	
				Lidar Operator <i>Mark Aho</i> Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5A042A Mission

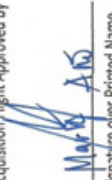
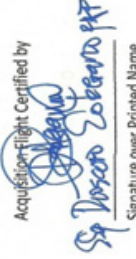

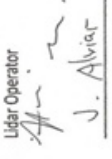
DREAM Data Acquisition Flight Log				Flight Log No.: 138										
1 LIDAR Operator: Lately Abuja	2 ALTM Model: Conn	3 Mission Name: 2AGN5A042A	4 Type: VFR	5 Aircraft Type: Casnna T206H	6 Aircraft Identification: PP-CG122									
7 Pilot: Epl. F. Cadenas	8 Co-Pilot: L. Marleydig	9 Route: Clat to Pasiguiran	12 Airport of Arrival (Airport, City/Province): Clat	17 Landing: Blat	18 Total Flight Time: 3 hrs									
10 Date: 6/2/11/2013	12 Airport of Departure (Airport, City/Province): Clat	15 Total Engine Time: 3427H	16 Take off: 102H											
13 Engine On: 0950H	14 Engine Off: 1317H	19 Weather: Good												
20 Remarks: <ul style="list-style-type: none"> - turbulent / possible data gaps - images not good / cloud shadow 														
21 Problems and Solutions:														
<table border="0" style="width: 100%;"> <tr> <td style="width: 33%;">Acquisition Flight Approved by</td> <td style="width: 33%;">Acquisition Flight Certified by</td> <td style="width: 33%;">Lidar Operator</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Lately Abuja Signature over Printed Name (End User Representative)</td> <td>F. CADENAS Signature over Printed Name (PAF Representative)</td> <td>Lately Abuja Signature over Printed Name</td> </tr> </table>						Acquisition Flight Approved by	Acquisition Flight Certified by	Lidar Operator				Lately Abuja Signature over Printed Name (End User Representative)	F. CADENAS Signature over Printed Name (PAF Representative)	Lately Abuja Signature over Printed Name
Acquisition Flight Approved by	Acquisition Flight Certified by	Lidar Operator												
														
Lately Abuja Signature over Printed Name (End User Representative)	F. CADENAS Signature over Printed Name (PAF Representative)	Lately Abuja Signature over Printed Name												



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A5H043A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 141	
1 LIDAR Operator: J. Alviar	2 ALTM Model: Pegasus	3 Mission Name: 1A5H043A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: RP-C9022
7 Pilot: A. Agbanyani	8 Co-Pilot: J. Clemente	9 Route: Clark - Binalawan - AgNO - Binalawan - Clark	10 Date: 12 Feb 2013	11 Airport of Arrival (Airport, City/Province): Clark	12 Airport of Departure (Airport, City/Province): Clark
13 Engine On:	14 Engine Off:	15 Total Engine Time:	16 Take off:	17 Landing:	18 Total Flight Time:
19 Weather: cloudy w/ slight drizzles					
20 Remarks: Mission completed (digitizer not used)					
21 Problems and Solutions: Camera ascension failed - restarted camera with new mission log (A5H043A)					
Acquisition Flight Approved by  Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Signature over Printed Name (PAF Representative)	Pilot-in-Command  Signature over Printed Name	Lidar Operator  Signature over Printed Name		



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGNI1049B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 155	
1 LIDAR Operator: IRo Restas	2 ALTM Model: Garmin	3 Mission Name: 2AGNI 1049B 014A	4 Type: VFR	5 Aircraft Type: Casenna T206H	6 Aircraft Identification: K1-10127
7 Pilot: L. Madegog	8 Co-Pilot: G. de la Cruz	9 Route: Agno - Talaoc	12 Airport of Arrival (Airport, City/Province): Clark		
10 Date: 02/19/2013	12 Airport of Departure (Airport, City/Province): Clark		15 Total Engine Time: 3	16 Take off: 1539H	17 Landing: 1759H
13 Engine On: 1554H	14 Engine Off: 1815H	18 Total Flight Time: 2+40			
19 Weather:					
20 Remarks:					
21 Problems and Solutions:					

Acquisition Flight Approved by _____ Signature over Printed Name (End User Representative)	Acquisition Flight Certified by  Sgt. Disisco Signature over Printed Name (PAF Representative)	Pilot-in-Command  _____ Signature over Printed Name	Lidar Operator _____ Signature over Printed Name
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Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN6A050A Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 157
1 LIDAR Operator: 170 RAS	2 ALTM Model: Garmin	3 Mission Name: 2AGN6A050A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: #1-C9122	
7 Pilot: Cpt L. Madrigal	8 Co-Pilot: C. de la Cruz	9 Route: Clark to Binobon				
10 Date: 02/10/2013	12 Airport of Departure (Airport, City/Province): Clark	12 Airport of Arrival (Airport, City/Province): Clark				
13 Engine On: 0824H	14 Engine Off: 1150H	15 Total Engine Time: 326	16 Take off: 0841H	17 Landing: 0924H	18 Total Flight Time: 3hrs	
19 Weather:			0924H	1049H		
20 Remarks:			1108H	1141H		
21 Problems and Solutions:						

Acquisition Flight Approved by	Signature over Printed Name (End User Representative)	Acquisition Flight Certified by	Signature over Printed Name (PAF Representative)
		<i>[Signature]</i>	<i>[Signature]</i>
		Sy Deseo Soriano PAF	



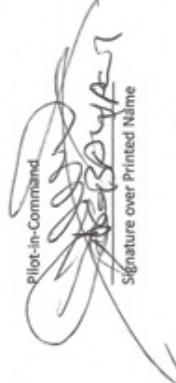

Pilot-in-Command	Signature over Printed Name	Lidar Operator	Signature over Printed Name
<i>[Signature]</i>			



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A6O050A Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 158	
1 LIDAR Operator: Mark Avo	2 ALTM Model: Pegasus	3 Mission Name: AGNO	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification: RP-CAP22
7 Pilot: Apollon	8 Co-Pilot: Clark	9 Route: Clark to Bivolongan	12 Airport of Arrival (Airport, City/Province): Clark	16 Take off: 3:10	18 Total Flight Time: 2:30
10 Date: 19 Feb 2013	11 Airport of Departure (Airport, City/Province): Clark	13 Engine On: 14:28	14 Engine Off: 14:28	15 Total Engine Time: 3:10	17 Landing: Clark
19 Weather: misty.	20 Remarks: survey - ok				
21 Problems and Solutions:					
<p>Acquisition Flight Approved by  Signature over Printed Name (End User Representative) Mark Avo</p> <p>Acquisition Flight Certified by  Signature over Printed Name (PAF Representative) Sgt. Doreo</p> <p>Pilot-in-Command  Signature over Printed Name Mark Avo</p> <p>Lidar Operator  Signature over Printed Name Mark Avo</p>					




DREAM

Disaster Risk Exposure and Assessment for Mitigation

Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1A6BS057A Mission





DREAM Data Acquisition Flight Log				Flight Log No.: 168	
1 LIDAR Operator: J. Abiar	2 ALTM Model:	3 Mission Name: 1A6BS057A	4 Type: VFR	5 Aircraft Type: Cessna T206H	6 Aircraft Identification:
7 Pilot: L. Madrogay	8 Co-Pilot: J. Clemente	9 Route: Clark - Binalonan - Pasayunan - Binalonan - Clark			
10 Date: 26 Feb 2013	12 Airport of Departure (Airport, City/Province): Clark	12 Airport of Arrival (Airport, City/Province): Clark			
13 Engine On: 1110 H	14 Engine Off: 1445 H	15 Total Engine Time: 3+30	16 Take off: 1132 H	17 Landing: 1440 H	18 Total Flight Time:
19 Weather: cloudy					
20 Remarks: Mission completed					
21 Problems and Solutions:					
Acquisition Flight Approved by		Acquisition Flight Certified by		Lidar Operator	
Signature over Printed Name (End User Representative)		Signature over Printed Name (PAF Representative)		Signature over Printed Name	
				 J. Abiar	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 1AGCS057B Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 170	
1 LIDAR Operator: Mark Anó	2 ALTM Model: Regulus	3 Mission Name: 1AGCS057B	4 Type: VFR	5 Aircraft Type: Cesnna T206H	6 Aircraft Identification: RP-C9022
7 Pilot: Madelyn	8 Co-Pilot: Clemente	9 Route: Clark to Pambujan	12 Airport of Arrival (Airport, City/Province):		
10 Date: Feb 24, 2013	12 Airport of Departure (Airport, City/Province):		16 Take off:	17 Landing:	18 Total Flight Time:
13 Engine On: 1535	14 Engine Off: 1815	15 Total Engine Time: 2740			
19 Weather: quickly cloudy					
20 Remarks: ok.					
21 Problems and Solutions:					
-					
Acquisition Flight Approved by	Acquisition Flight Certified by	Pilot-in-Command	Lidar Operator		
				Signature over Printed Name	
Signature over Printed Name (End User Representative)	Signature over Printed Name (PAF Representative)	Signature over Printed Name	Signature over Printed Name		



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2A5OQ57B2 Mission

DREAM Data Acquisition Flight Log				Flight Log No.: 169	
1 LIDAR Operator: <i>Arady Acuña</i>	2 ALTM Model: <i>Gemini</i>	3 Mission Name: <i>Gemini</i>	4 Type: <i>VFR</i>	5 Aircraft Type: <i>Cesna T206H</i>	6 Aircraft Identification: <i>LP-CJ122</i>
7 Pilot: <i>Cpt. F. Cadena</i>	8 Co-Pilot: <i>Cpt. A. Heryani</i>	9 Route: <i>Clark - Pagsanjan</i>	12 Airport of Arrival (Airport, City/Province): <i>Clark</i>		
10 Date: <i>02/26/2013</i>	11 Airport of Departure (Airport, City/Province): <i>Clark</i>	15 Total Engine Time: <i>2:05</i>	16 Take off: <i>15:30H</i>	17 Landing: <i>17:15H</i>	18 Total Flight Time: <i>1:45</i>
13 Engine On: <i>15:15H</i>	14 Engine Off: <i>17:20H</i>	19 Weather: <i>for a while good, storm after two hrs, it started raining, move on to another survey area, it started, is still raining so I decided the mission</i>			
20 Remarks: <i>Finished a tie line and a line but I don't think it would be useful enough to be processed.</i>					
21 Problems and Solutions:					
Acquisition Flight Approved by <i>Arady Acuña</i> Signature over Printed Name (End User Representative)		Acquisition Flight Certified by		Lidar Operator <i>Arady Acuña</i> Signature over Printed Name	
		Pilot-in-Command		Signature over Printed Name	



Annex F

FLIGHT LOGS FOR AGNO FLOODPLAIN

Flight Log for 2AGN5OQ059B Mission

DREAM Data Acquisition Flight Log						Flight Log No.: 175
1 LIDAR Operator: <u>POPTS</u>	2 ALTM Model: <u>GBM</u>	3 Mission Name: <u>2AGN5OQ059B</u>	4 Type: <u>VFR</u>	5 Aircraft Type: <u>Casna T206H</u>	6 Aircraft Identification: <u>77-0110</u>	
7 Pilot: <u>AGNO/AMM</u>	8 Co-Pilot:	9 Route: <u>PAH - PHAG - CA</u>	10 Date: <u>08 Feb 13</u>	12 Airport of Arrival (Airport, City/Province): <u>CA</u>	17 Landing: <u>1800H</u>	18 Total Flight Time: <u>3130</u>
13 Engine On: <u>1400H</u>	14 Engine Off: <u>1800H</u>	15 Total Engine Time: <u>400</u>	16 Take off: <u>1400H</u>	12 Airport of Departure (Airport, City/Province): <u>CA</u>		
19 Weather: <u>Clear</u>	20 Remarks: <u>1. Post flight, AGNSQ + AGNSO</u>					
21 Problems and Solutions:						

Acquisition Flight Approved by	Acquisition Flight Certified by	Pilot-in-Command	Lidar Operator
Signature over Printed Name (End User Representative)	Signature over Printed Name (PAF Representative)	Signature over Printed Name	Signature over Printed Name





D R E A M
Disaster Risk and Exposure Assessment for Mitigation

