Data Supply Metadata s2

Project	Christchurch LiDAR March 2011	11.010
Sub Area	Part 2 of Priority 1 and Part 1 of Priority 2	

Summary of Data	This dataset is the second of a series that NZ Aerial Mapping (NZAM) is producing to support the response to the 22 February 2011 earthquake in Canterbury. It is a collection of products created from airborne LiDAR point cloud datasets. The data supply includes the following products: • Project extent data • Classified LiDAR point cloud data • DEM • 0.5m interval contours • 1-dimension DEM difference model The extent of coverage of this a dataset is shown in a map in Appendix A.

Data Acquisition	NZAM collected LiDAR over the entire project area between 8 March 2011 21:00 hours and 10 March 2011 18:00 hours. During this time 21 hours of data acquisition was completed. A map showing the entire project area is included in Appendix A. The LiDAR sensor used for the collection was an Optech Gemini (07SEN211). The data was collected flying 900m AGL and using sensor settings of 100kHz PRF, 48 Hz scan frequency, 40 degrees field of view. To support the georeferencing of the sensor a GPS base station receiver was operated at a temporary survey mark that NZAM established at Christchurch Airport. Independent of this work GNS staff field surveyed LiDAR control sites. These were used to bring the LiDAR dataset into terms of the post-earthquake 22 February 2011 geodetic system. The report on the details of this work is still being prepared by GNS, but will be included in later data supplies for this project. GNS also provided NZAM with post-earthquake coordinates for the Geosystems iBASE reference station WIGRAM.

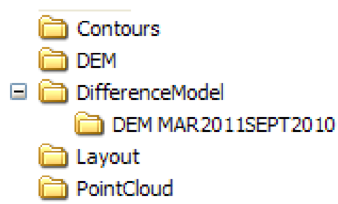
Data Processing	The LiDAR sensor positioning and orientation (POS) was determined using the collected GPS/IMU datasets and Applanix POSPac software. This work was all undertaken in NZGD2000 coordinate system, and made use of the data collected at the temporary GPS reference station NZAM established at Christchurch Airport. The coordinate for this temporary mark was computed using data from the WIGRAM iBASE station and its post-earthquake coordinate. The POS data was combined with the LiDAR range files and used to generate LiDAR point clouds in New Zealand Transverse Mercator (NZTM) map projection but NZGD2000 ellipsoidal heights. This process was completed using Optech DASHMap and LMS LiDAR processing software. The subsequent steps were undertaken using TerraSolid LiDAR processing software modules TerraScan, TerraPhoto and TerraModeler. The data was checked for completeness of coverage. The relative fit of data in the overlap between strips was also checked. The point cloud data was then classified into ground, first and intermediate returns using automated routines tailored to the project land cover and terrain. The data was converted from NZGD2000 ellipsoidal heights into orthometric heights using the LINZ NZGeoid09 and offset separation model. Comprehensive manual editing of the LiDAR point cloud data was undertaken to increase the quality of the automatically classified ground point dataset. This editing involved visually checking over the data and changing the classification of points into and out of the ground point dataset. The *NZAM 10cm GSD 20110224 orthophotography* dataset was used as a backdrop when undertaking the manual editing. As part of the manual edit process LiDAR returns from the sea, estuary and rivers wider than 10m were moved into a water point dataset. However, no supplementary points have been added to support hydrological flows around and along bodies of water. The height accuracy of the data has been checked using the one control site that GNS surveyed within this area. This was done by calculating height difference statistics between a TIN of the LIDAR ground points and the surveyed points. The standard deviation statistic for the data is +/-0.04m. An average height difference of 0.05m was observed. This bias was removed to effectively bring the dataset into terms of post earthquake Lyttelton Vertical Datum 1937. Due to the small sample size the standard deviation statistic gives an optimistic view of the dataset's vertical accuracy, and the LiDAR manufacture specifications is that the sensor is capable of collecting data with +/-0.1m accuracy (excluding GPS error and Geoid modelling error). The positional accuracy of the data has been checked by overlaying GNS surveyed data over the LIDAR data displayed coded by intensity. The data was found to fit well in position.

Data Processing
continued

The classified LiDAR point cloud dataset was used in the creation of the series of products described in the Data Supply section of this report. Included in the products is a difference model. The model is a grid of heights that shows the elevation differences between a 0.5m grid spacing DEM created from this March 2011 LiDAR dataset and the September 2010 LiDAR dataset collected by NZAM after the Darfield Mw7.1 earthquake. The DEM were created by interpolating values from TIN formed using the LiDAR points classified as ground and water. The grid spacing of 0.5m was specified by GNS.

Data Supply

The geodata is all in terms of New Zealand Transverse Mercator map projection and Lyttelton Vertical Datum 1937. The data is presented in a series of folders.



The *Contours* folder contains 0.5m contour interval contours. The contours were interpolated from a TIN created using LiDAR point cloud dataset. The data is in ESRI 3D polyline file format. The data contains the attribute fields TYPE [INDEX|INTER] and ELEVATION {m}. Every 5th contour in the dataset has TYPE=INDEX.

The folder *DEM* contains a 0.5m GRID spacing DEM. This is in ESRI ASCII GRD file format. The DEM were created by interpolating values from TIN formed using the LiDAR points classified as ground and water.

The folder *DifferenceModel* has a subdirectory that contains the 1-n dimension model producted by subtracting a DEM from SEPT2010 LiDAR from the DEM included in this data supply. The extent of this dataset only extents to the area where there is overlap between datasets. This area is depicted in the extent of coverage map included in Appendix A.

The *Layout* folder has support files in it including a tile layout, project extent and difference model extent.

Data Supply	The folder *PointCloud* contains the classified LiDAR point cloud dataset. This data is in LAS v1.2 file format. Data is contained in the point classes: 1 *Unclassified*, 2 *Ground*, 9 *Water* and 32 *Non Ground*. The points in class 32 are points that have been measured as having a height greater than 0.5m above the *Ground* points. They are the LiDAR returns from vegetation, buildings, bridges, cars and all other such items. The points in class 1 are those left over from the ground classification. If you have requirements for the data in other file formats, map projections please contact NZAM.

Special Note	Considerable professional judgement is required when using the difference products. Consideration needs to be made for landuse and landcover changes that have occurred between the times that the datasets were collected. To give them context they should be viewed in conjunction with aerial photography. The *NZAM 10cm GSD 20110224 orthophotography* dataset provides imagery context a week prior to when the March 2011 LiDAR was collected. Consideration also needs to be made for the accuracy and modelling characteristics of LiDAR data. NZAM consider that field validation of output is a prerequisite for use.

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Date of Metadata Creation	14 March 2011
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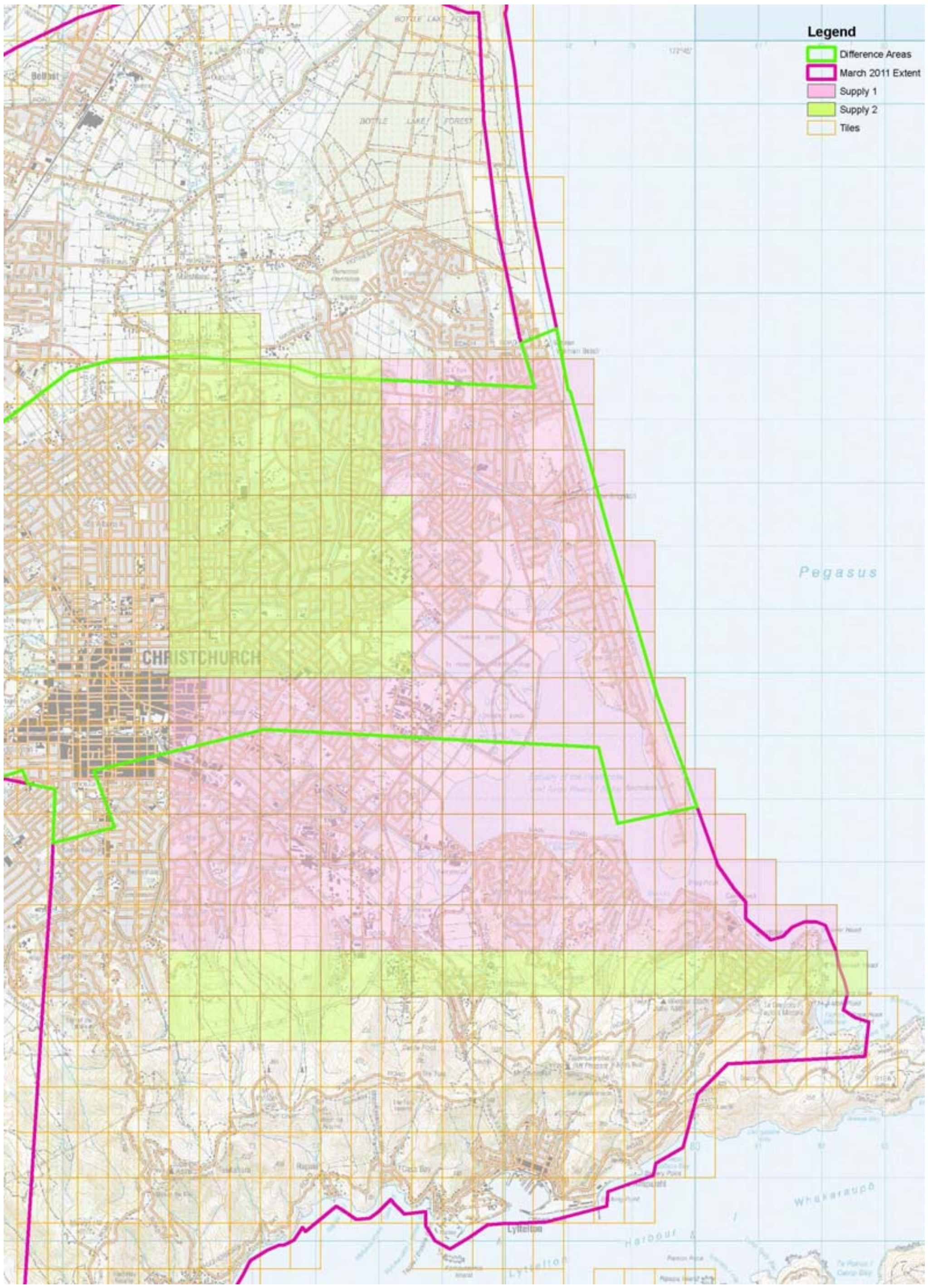
Appendix A: Project Areas

<table>
<tr>
<td>Extent of supplied data</td>
<td>
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Extent of Project