

C160  C161

**KURSUS COORDINATED CADASTRAL SYSTEM (CCS)
INSTITUT TANAH & UKUR NEGARA
BEHRANG, PERAK**

**PILOT PROJECT
COORDINATED CADASTRAL SYSTEM**

OLEH:
PROF DR ABD MAJID BIN A KADIR & ABDULLAH HISAM OMAR
*Fakulti Kejuruteraan & Sains Geoinformasi
Universiti Teknologi Malaysia
Skudai , Johor.
Email: majid@fksg.utm.my*

C172 **10-12 JUN 2002** C173

Cont... C160 **Development of Implementation Plan of CCS for
Malaysia: Research Objectives** C161

The main objective of this study is:

- i. To develop and realize a geocentric based Cadastral Control Data Base**
- ii. To establish methodology for the Development of National Digital Cadastral Data Base**
- iii. To develop techniques for integrating the digital Cadastral Data with Mapping Data**
- iv. To address the Institutional Issues on the Implementation of CCS.**

C172 C173

DEFICIENCIES IN THE PRESENT CADASTRAL SYSTEM

General – problems associated with cadastral survey system:

■ General Deficiencies in the Cadastral Survey System

- ◆ “Whole to the Part” concept not utilized.
- ◆ Survey errors – not properly distributed and adjusted.
- ◆ Use of running traverses.
- ◆ Some earlier surveys – uncoordinated.
- ◆ Use of natural feature boundaries.

■ Difficulties in Using Different Projection Systems

- ◆ Problems of data integration.
- ◆ Complications when survey crosses from one State to another.

Cont...

■ Incompatibility with Current Technologies

- ◆ Systems provided by new technologies – increasingly coordinate based
- ◆ Cadastral survey system based on parcel dimensions and relative locations. Therefore, not in a position to take advantage of new technologies.

■ Inadequacy of the DCDB

- ◆ Cadastral parcels – one of the core data sets for Malaysian LIS/GIS.
- ◆ DCDB – the most sought after information source. Unfortunately, has flaws propagated through deficiencies of the cadastral survey system.

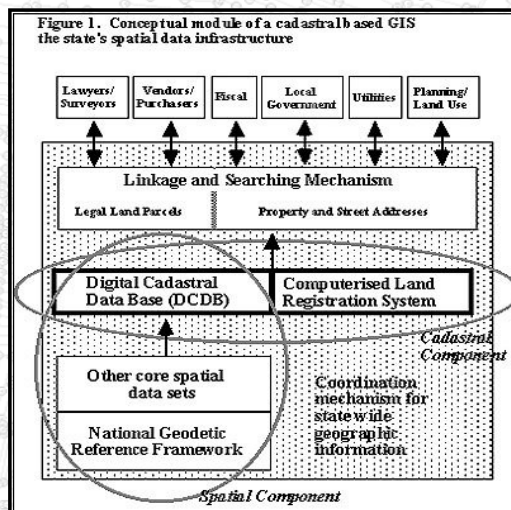
■ Obsolete Rules and Regulations

- ◆ Increasing number of provisions superseded by advances and changes in technology.

CONCEPT OF COORDINATED CADASTRE

Adapted from Williamson (1996)

- i) **First Version** of a coordinated cadastre is where the complete cadastral framework is based on coordinates determined by ground survey that is referred to a coordinate system. The said survey is used to define, describe, and re-define parcel boundaries, and its outcome shown graphically on a cadastral map, which in its digital form would form the Digital Cadastral Data Base (DCDB). The conduct of ground surveys and related processes usually result in an accurate cadastral map or DCDB and towards that fulfillment, requires sufficient density of control.
- ii) **Second Version** is largely similar with the above description, the only difference being that the coordinates as determined are given legal significance. In this case the coordinates take precedence over boundary marks in the redefinition of boundaries.



Conceptual Module of A Cadastral Based Spatial Data Infrastructure

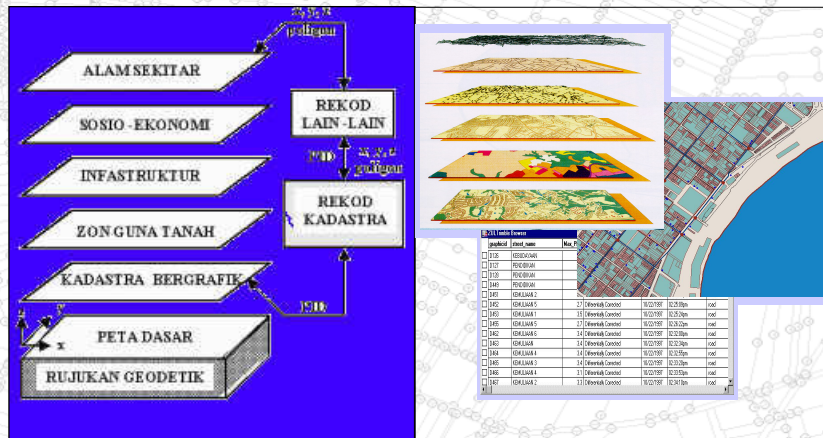
COORDINATED CADASTRAL SYSTEM (CCS) STATEMENT FOR MALAYSIA

- The coordinate-based cadastral system simply means that coordinates are given greater emphasis. Bearings and distances are, therefore, only a means by which the final adjusted coordinates are derived.
- This concept allows: (i) the availability of abundance of survey control stations whose coordinates are given with respect to a geocentric datum; (ii) the adoption of a single coordinate projection system for the whole country; and (iii) the application of a rigorous network adjustment technique on survey accurate data so that a unique pair of coordinates and their respective accuracy information can be defined for every cadastral boundary marks.

THE IMPORTANCE OF THE STUDY

- Coordinated Cadastral System (CCS) – a cadastral reform programme to improve the cadastral survey system. Implementation of CCS – *feasible*, according to results of feasibility study.
- Long term benefits to be accrued from CCS implementation:
 - ◆ Utilizing “Whole to the Part” methodology.
 - ◆ Facilitate use of rapid data acquisition, storage, processing & management techniques.
 - ◆ Improvement of the cadastral survey system.
 - ◆ Provides common reference system.
 - ◆ Facilitate data integration.
 - ◆ CCS – basis for / underpins a good LIS.
 - ◆ Others

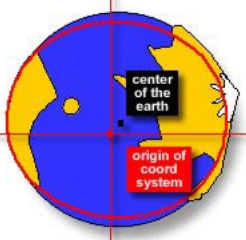
CCS – UNDERPINS A GOOD LAND INFORMATION SYSTEM (LIS)



Coordinate –based LIS facilitate data integration process in GIS Environment

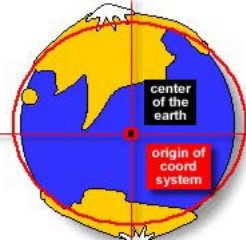
BEFORE INOVATION AFTER INOVATION

LOCAL GEODETIC DATUM



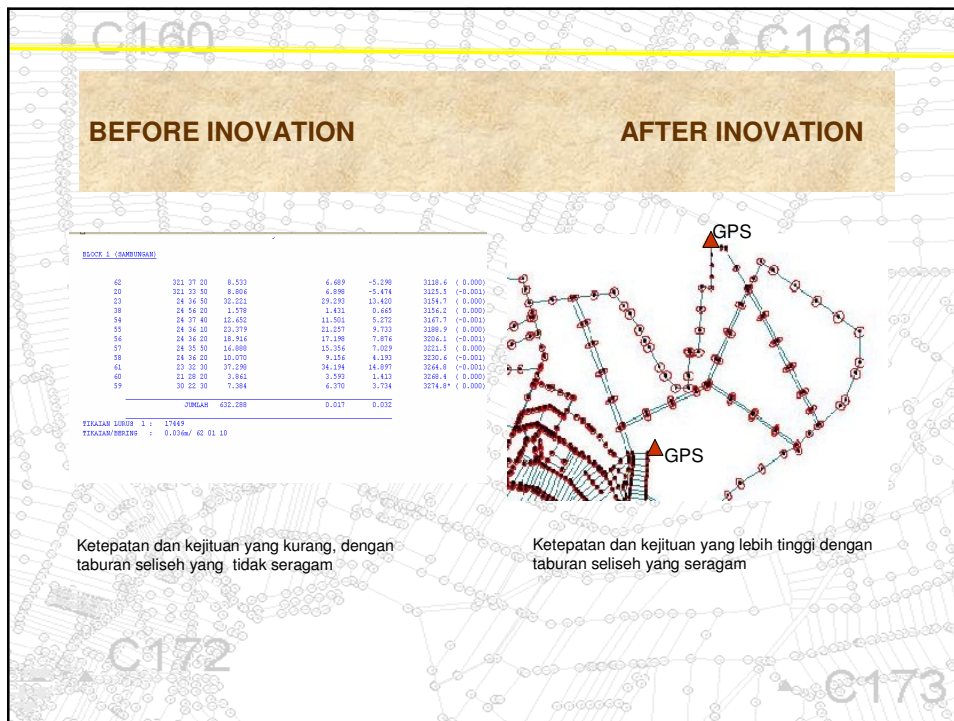
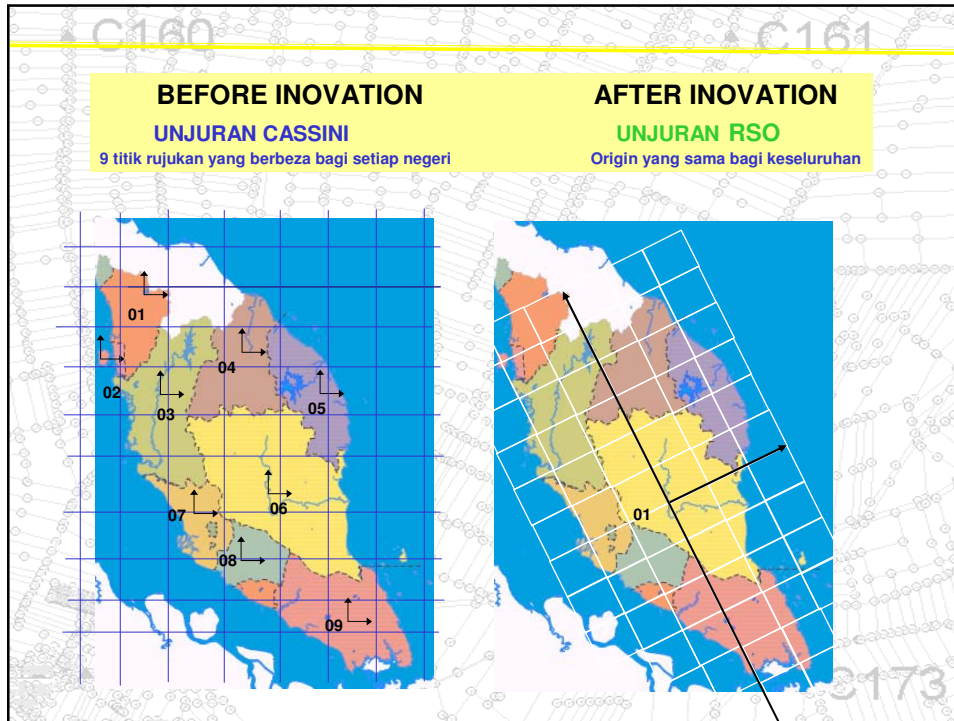
ELIPSOID MODIFIED EVEREST
ORIGIN DI KERTAU

GEOCENTRIC DATUM



ELIPSOID WGS 84
ORIGIN DI PUSAT BUMI

Integrasi data spasial secara global dapat dilaksanakan



C160 C161

BEFORE INOVATION **AFTER INOVATION**

TENAGA KERJA YANG RAMAI

TIDAK PERLU TENAGA KERJA YANG RAMAI

73

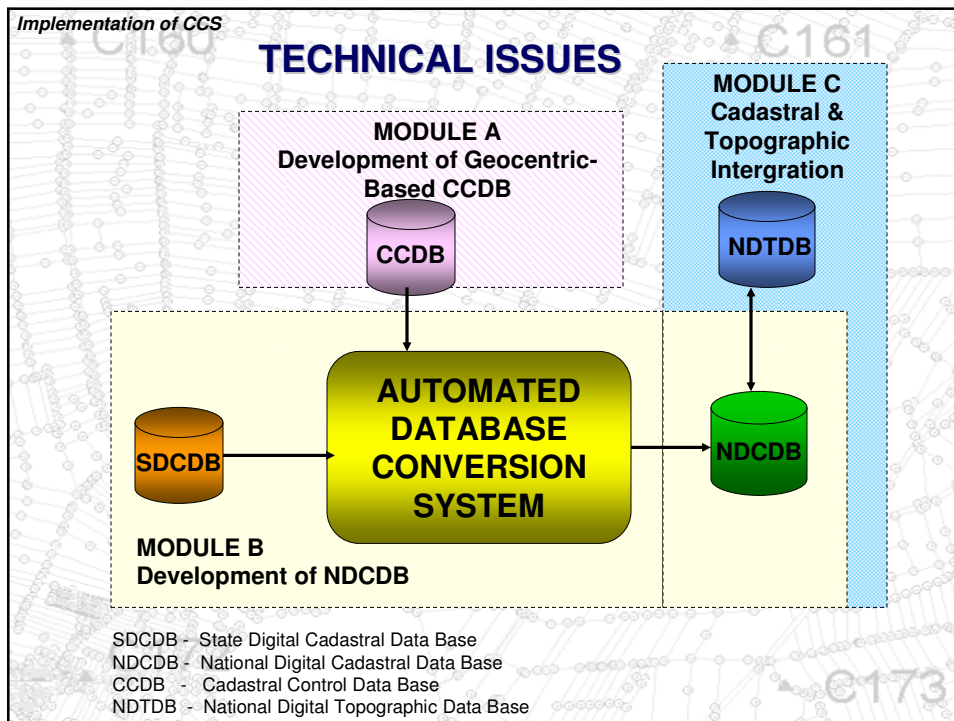
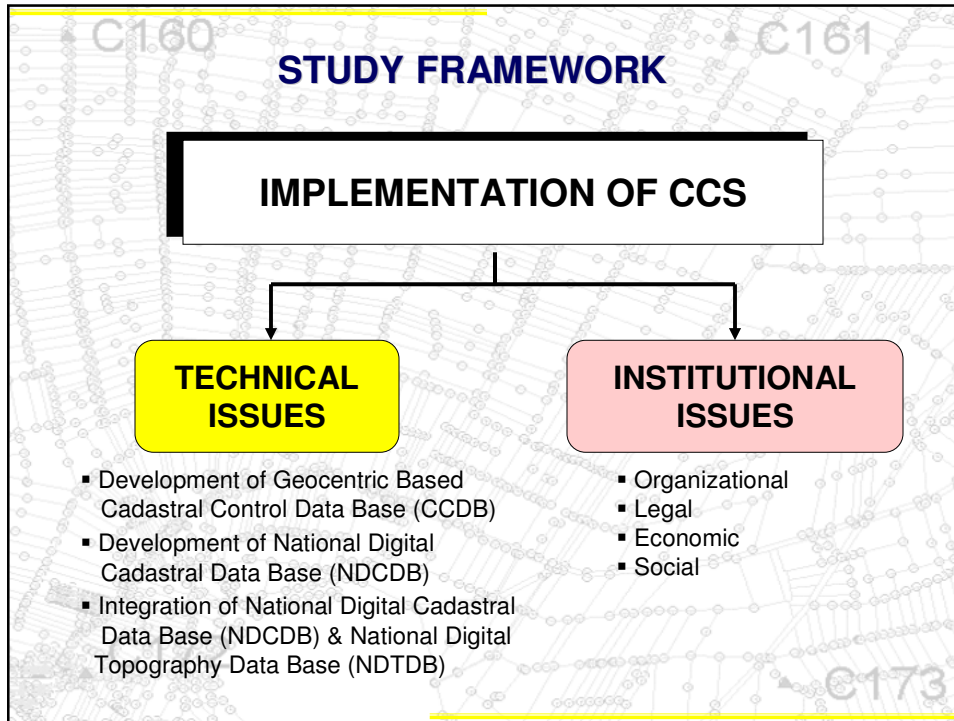
C160 C161

BEFORE INOVATION **AFTER INOVATION**

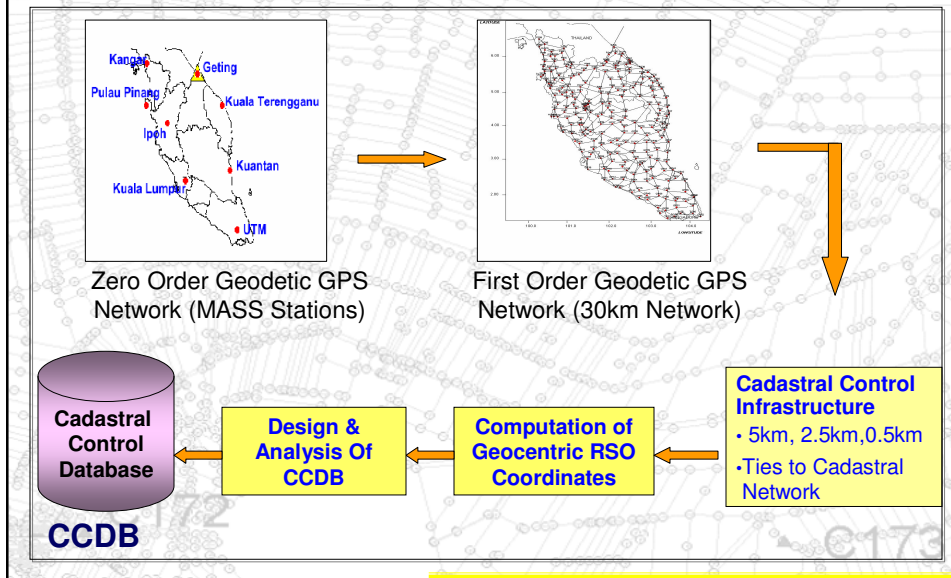
Koodinat plotan tidak dilaras secara keseluruhan

Koodinat terlaras dihasilkan

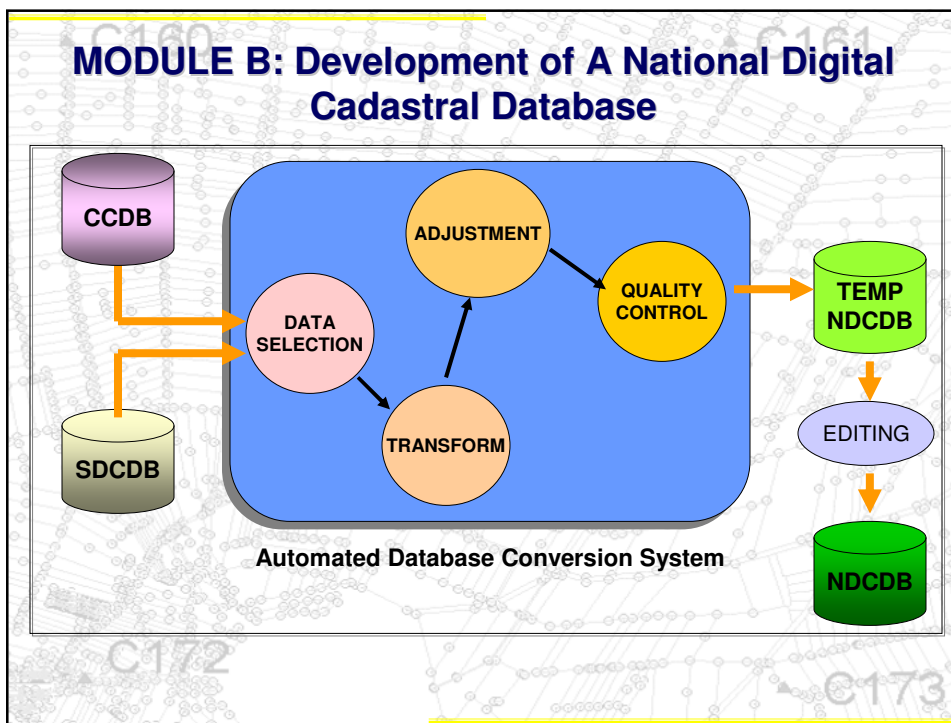
C173



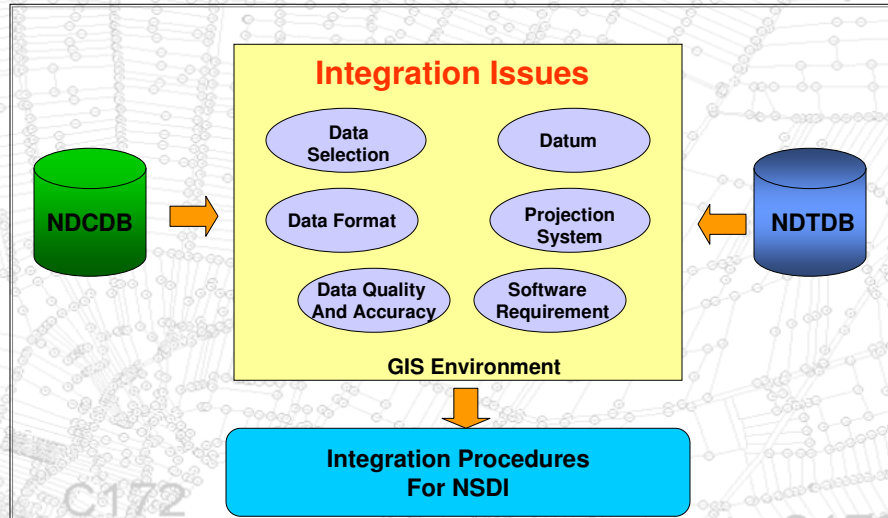
MODULE A: Development of A Geocentric- Based Cadastral Control Database



MODULE B: Development of A National Digital Cadastral Database

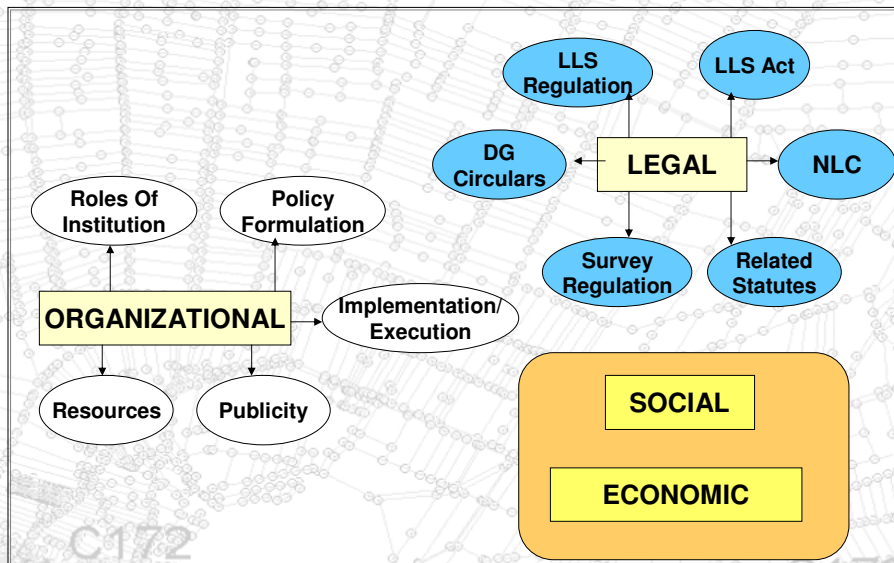


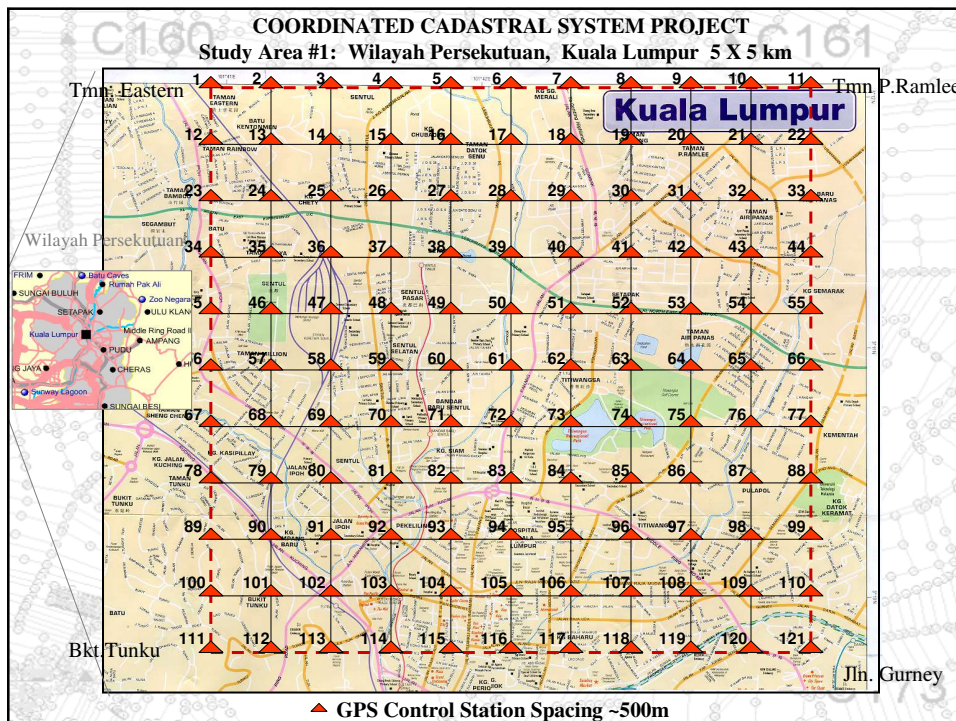
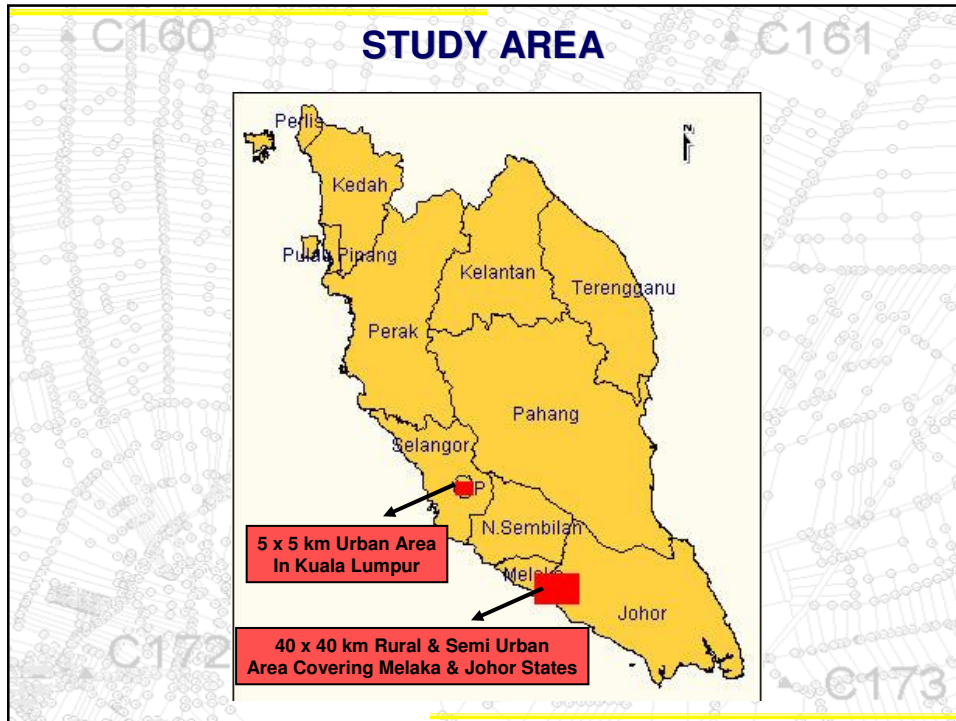
MODULE C : Techniques For Integrating The Digital Coordinated Cadastral Data With Mapping Data

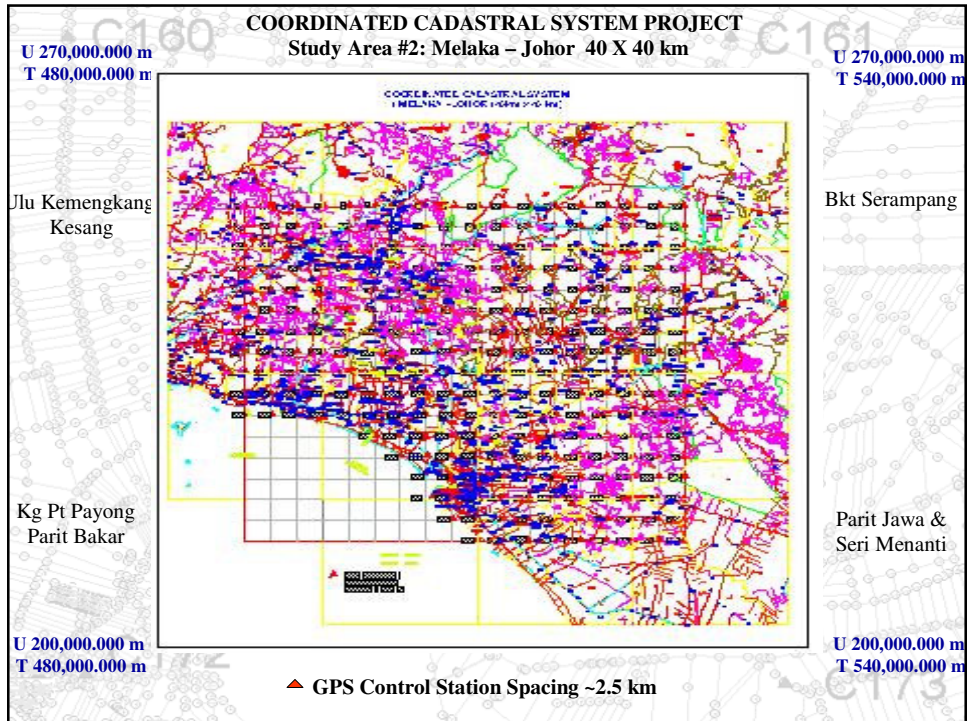


IMPLEMENTATION OF CCS

Institutional Issues (Module D)







Cadastral Control Infrastructure Development

PHASE	MELAKA	REMARKS	JOHOR	REMARKS
Reconnaissance*	Mac 2001	131 of 132 stations have been identified	Mac 2001	89 of 132 stations have been identified
Monumentation*	Mac 2001	Standard Traverse, Pipe and Cadastre mark	Mac 2001	Standard Traverse, Pipe and Cadastre mark
GPS Field Observation *	19 Mac – 7 April	Jasin, Melaka Tengah, Alor Gajah	7 Apr – 14 April	Muar
GPS Processing and Results*	Results Delivered: 3/5/2001			

* Note: Geodesy Section, JUPEM Melaka and JUPEM Johor

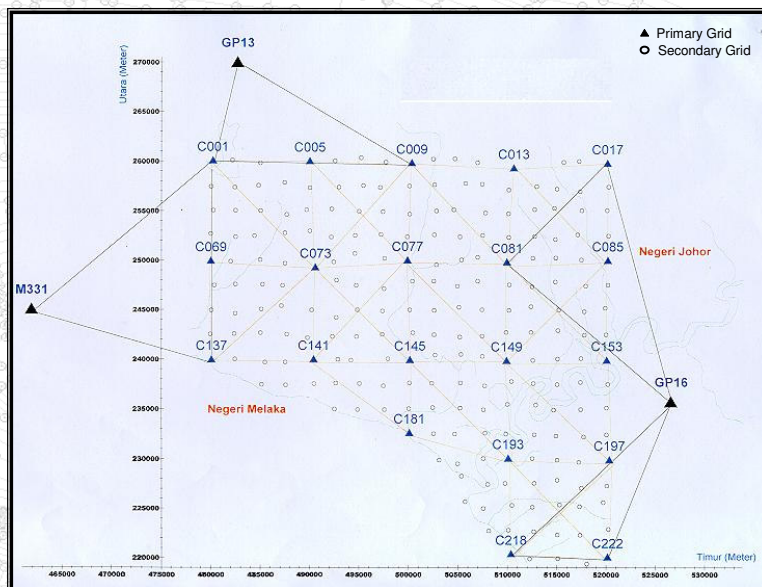
Cont...

GPS Field Observation For Study Area # 2 (Melaka – Johor)

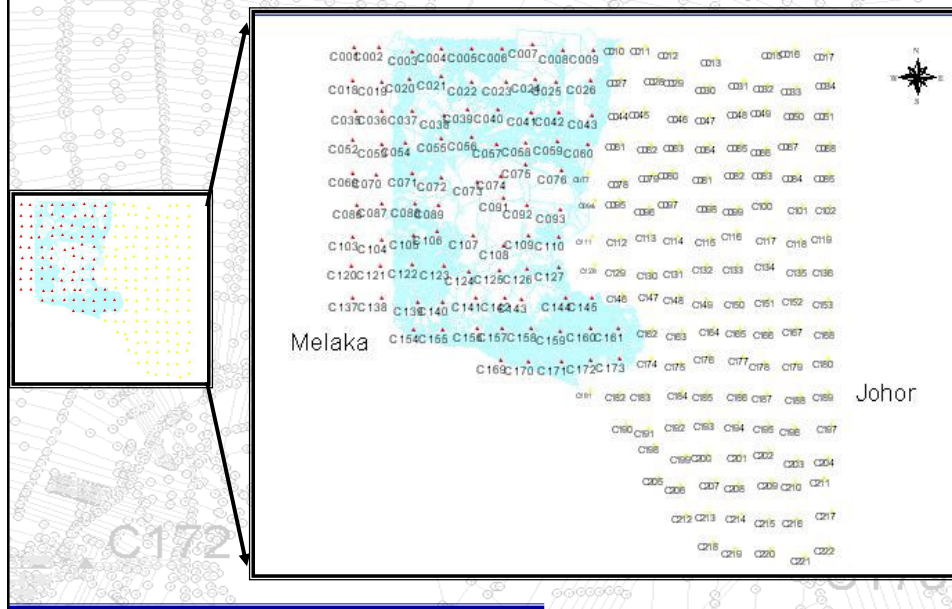
- ☞ GPS Network Grid consists of
 - Primary Grid (10 km x 10 km)
 - Secondary Grid (2.5 km x 2.5 km)

Observation Technique	Primary Grid	Secondary Grid
	Static Reference Stations: M331 (Tg.Keling, Melaka), GP13 (Tebong, Melaka), GP16 (Pagoh, Johor)	Rapid Static : Reference Stations Primary Grid Points
Observation Time	90 minutes	15-30 minutes
Total of Stations	23	197
GPS Processing Software	Trimble Geomatic Office V1.1	Trimble Geomatic Office V1.1
Adjustment Software	Geolab 2.4c	Trimble Geomatic Office V1.1

GPS Network Grid For Study Area # 2: Melaka



Cadastral Control Infrastructure For Study Area # 2



Statistics of GPS Derived Coordinates From Two Base Stations

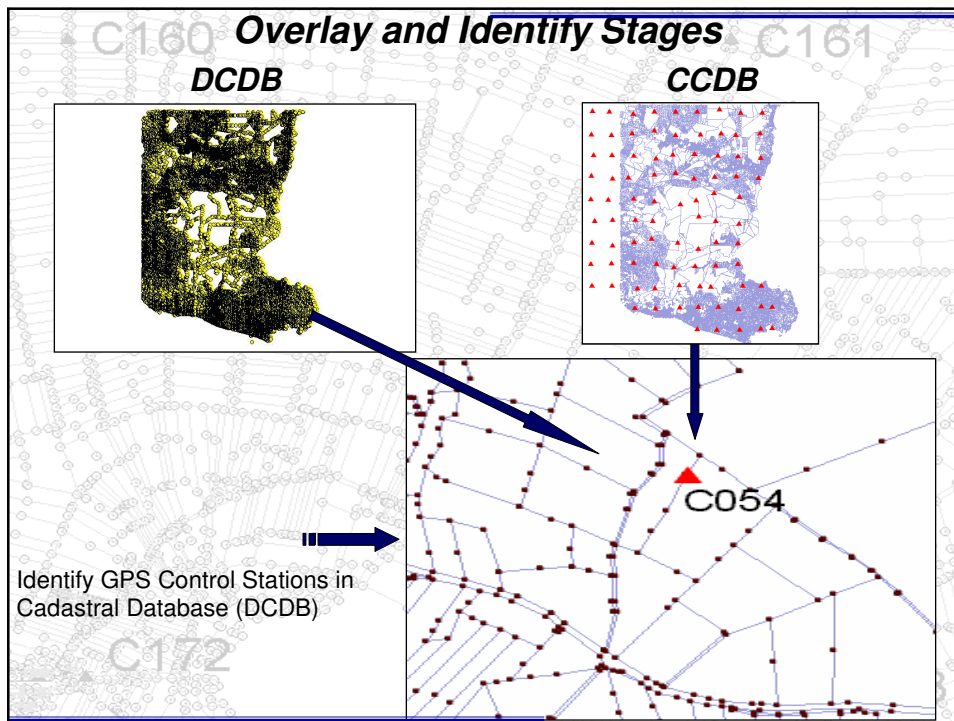
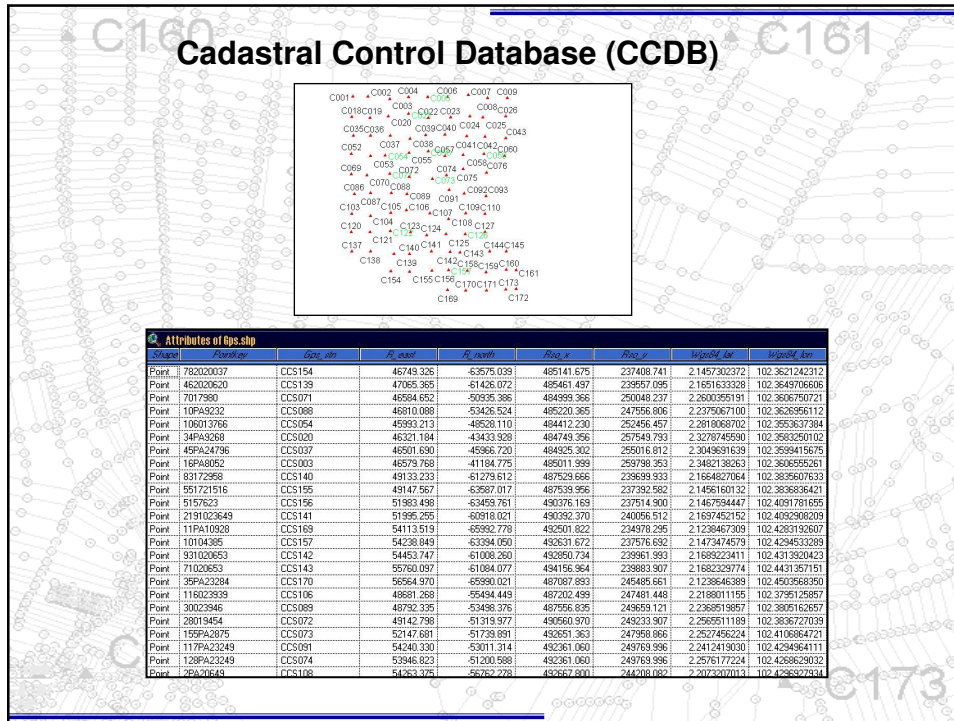
Table 1. Summary of Coordinates Differences : Melaka

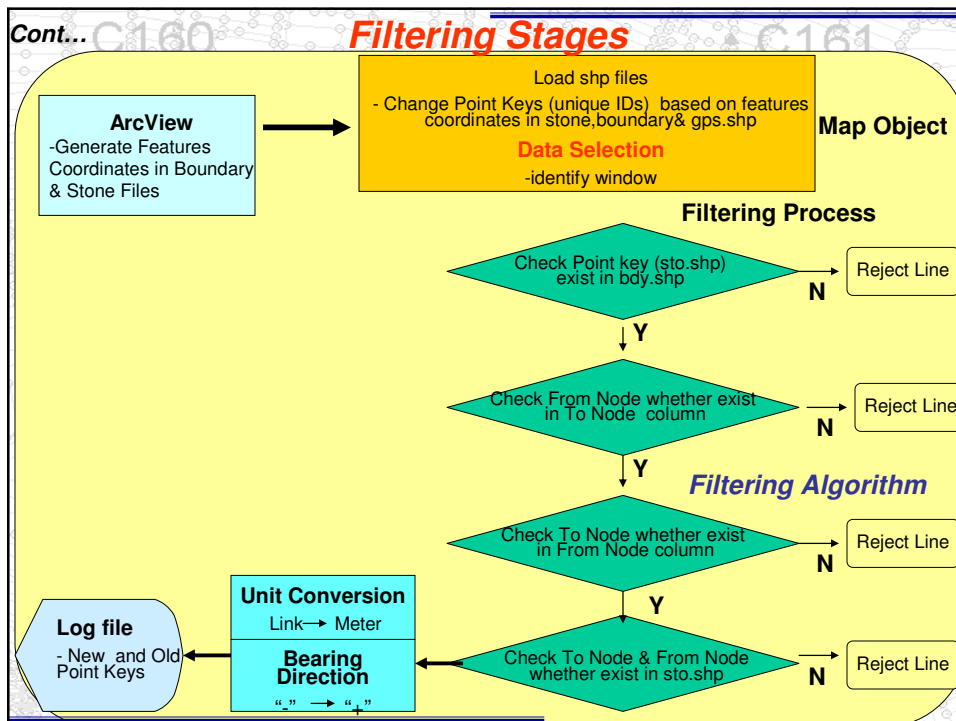
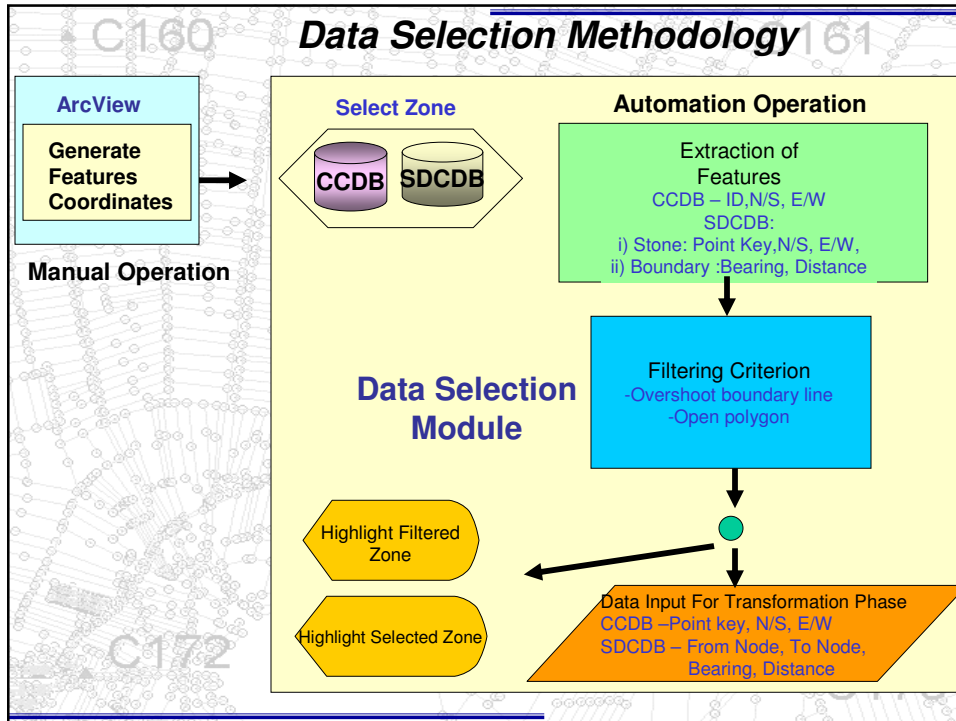
	North/South (cm)	East/West (cm)
Maximum	2.7	3.7
Minimum	0.1	0.1

Table 2. Summary of Coordinates Differences : Johor

	North/South (cm)	East/West (cm)
Maximum	3.7	3.7
Minimum	0.2	0.1

Note: i) Tables 1 and 2 conclude that coordinates differences are below 4 cm tolerance (as discussed)





Cont... C160 C161

Log File: New and Current Point Keys

DATA SELECTION MODULE

MAP DISPLAY DATA TABLE

CCSBODY Records selected: 76 of 116034 (Pland: 30)

APPDATE	INSTRUMENT	STATION	DISTANCE	UNITS	CLASS	LINE CODE	LINE TYPE	ENTRANCE MODE	STATUS
1970323	040218000224	814.5730							PA200
1970323	040218000224	4.4000							PA200
1970323	040218000226	814.5730							PA200
1970323	040218000226	385.0000							PA200
1970323	040218000226	277.4200							PA200
1970323	040218000224	4.3000							PA200
1965046	040218000154	35.2200							PA112

GPS Records selected: 1 of 81

PRIME KEY	INSTR	STATION	CLASS
9181124	C173	64131.647	

CCS10 Records selected: 26 of 10600

POINT KEY	APPDATE	MARK	CLASS
79A2000	1970323	8W.B	
79A2000	1970323	8W.B	
79A2000	1970323	8W.B	
2181124	1970323	8W.B	
2181124	1980048	B.A.L.	
2181124	1980048	B.A.L.	
2181124	1980048	B.A.L.	
1181124	1970323	8W.B	

Total of Changes: 29 Total of Reference: 29 Total

Click The Filter Button

DATA SELECTION MODULE

MAP DISPLAY DATA TABLE

Case No: 198001

Case Name: [Empty]

File name: [Empty]

Save as type: DAT format (dat)

Save as: [Empty]

Save as read only:

CCSBODY: 81 BF 116034

GPS: 1 BF 81

CCS10: 26 BF 10600

Show Filter Log Show Current Selection

Save to StarNet Format

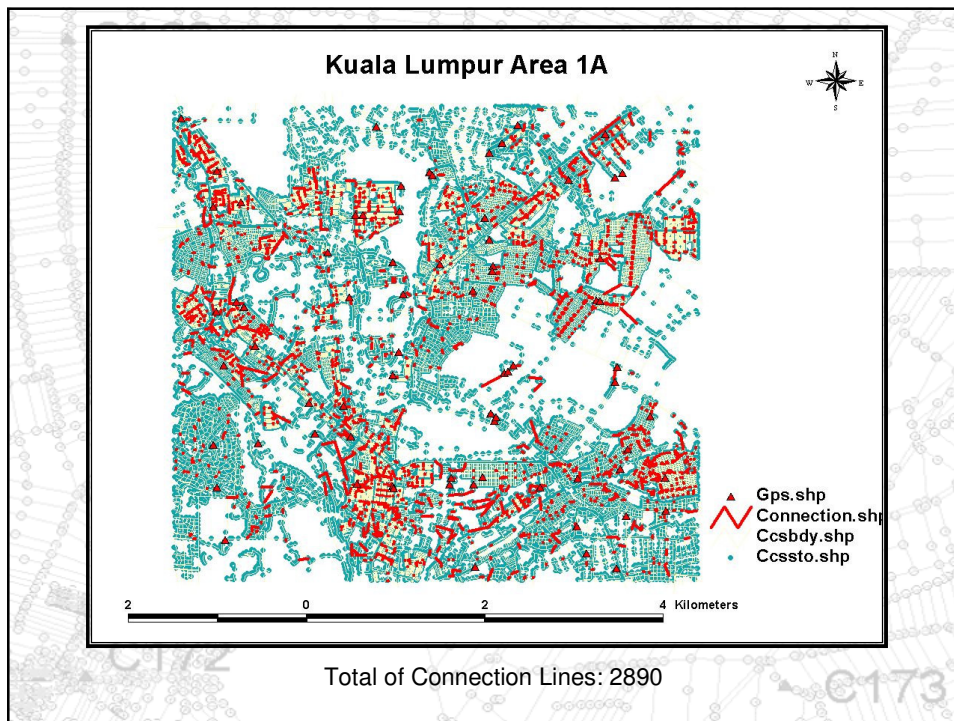
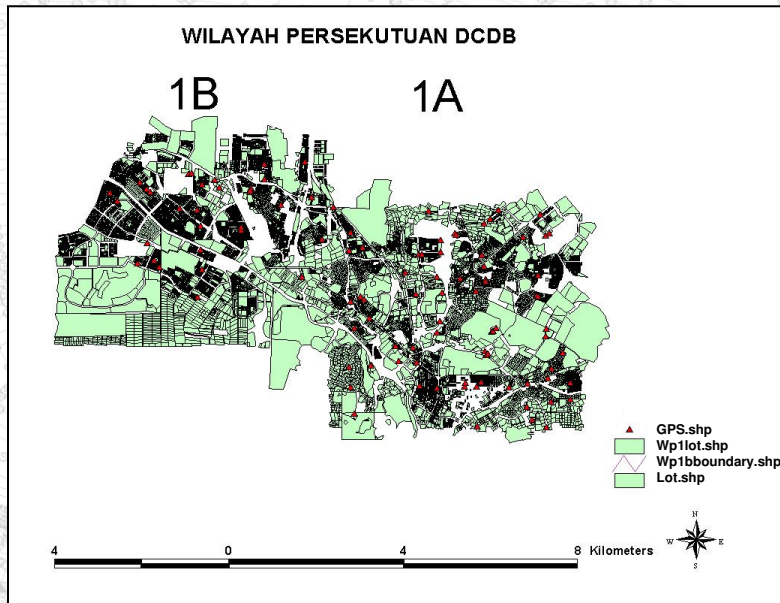
C172

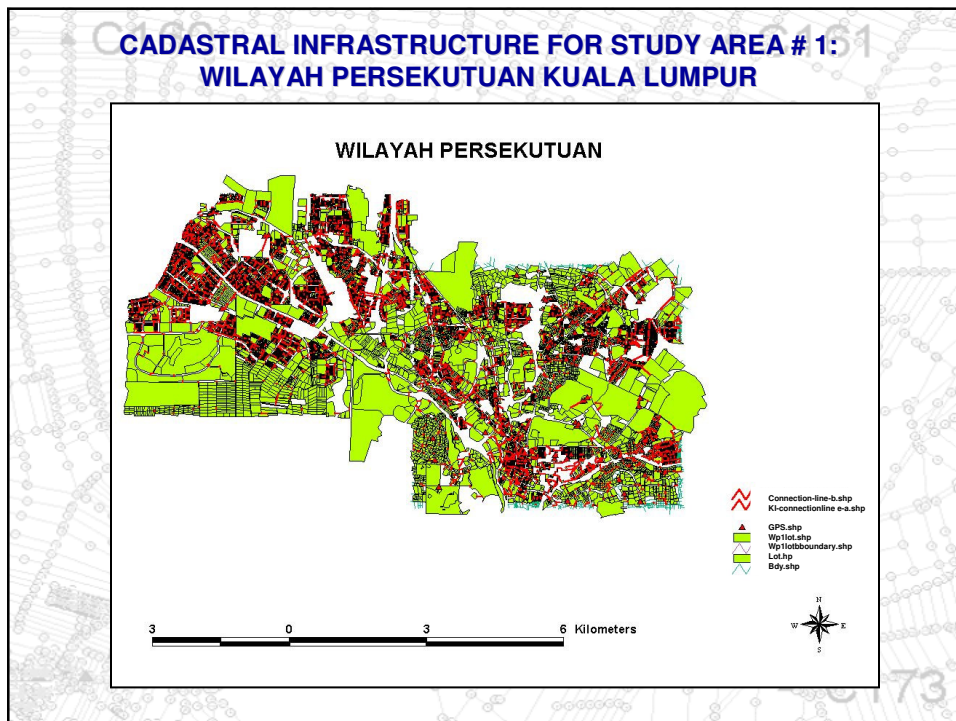
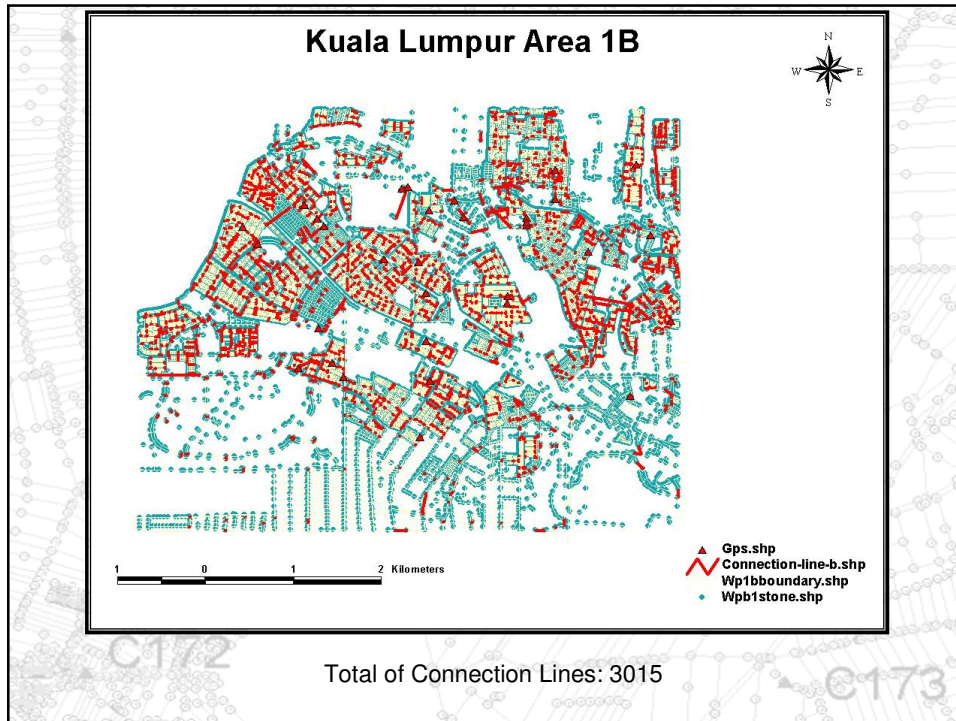
C160 C161

PREPARATION OF DATA INPUT & CONNECTION LINES

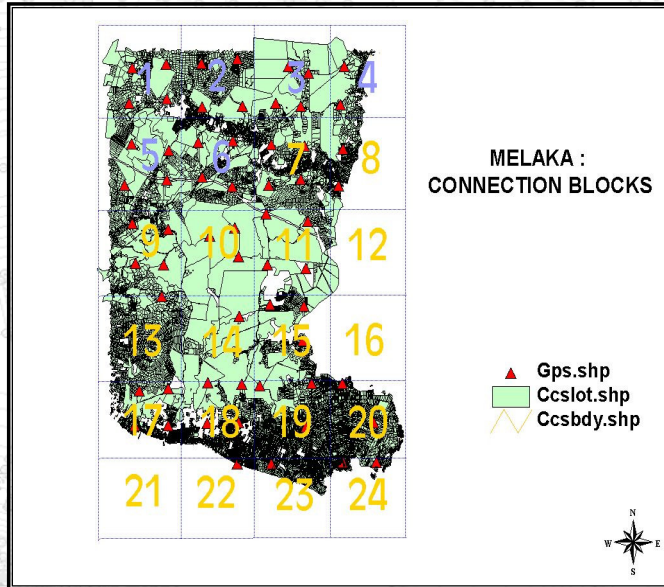
C172 C173

**DIGITAL CADASTRAL DATABASE FOR STUDY AREA # 1: 1
WILAYAH PERSEKUTUAN KUALA LUMPUR**

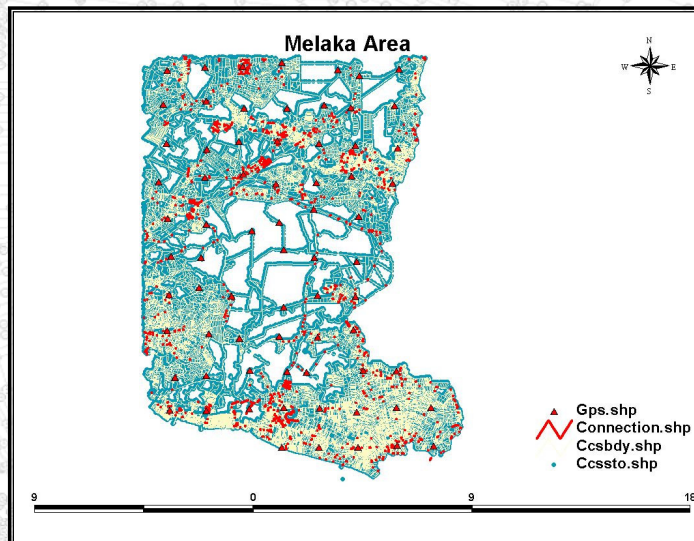




PREPARATION OF DATA INPUT: MELAKA

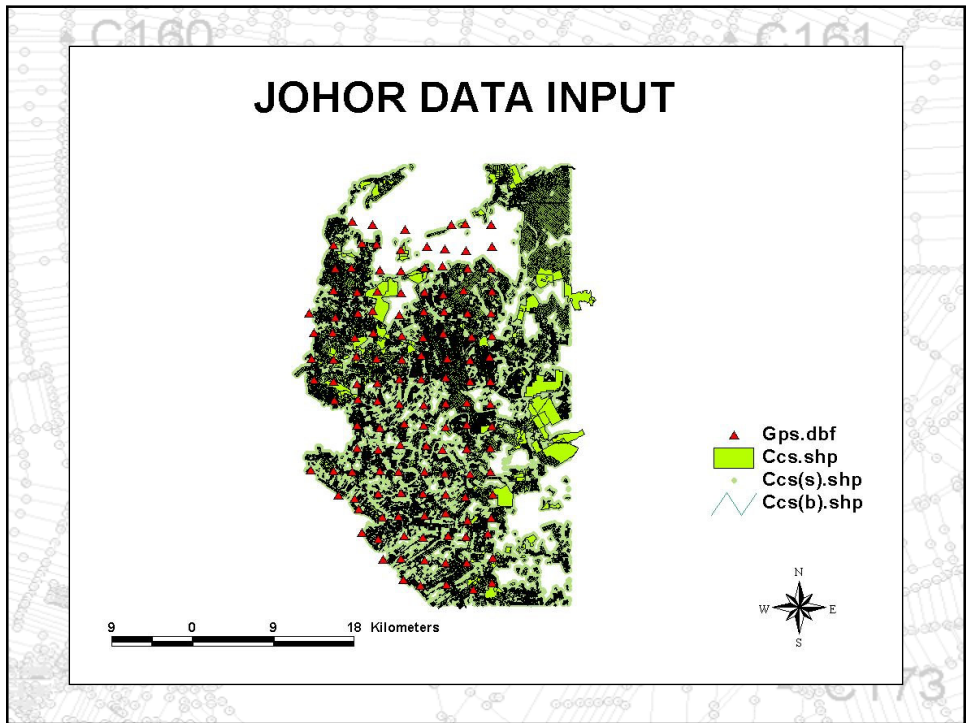
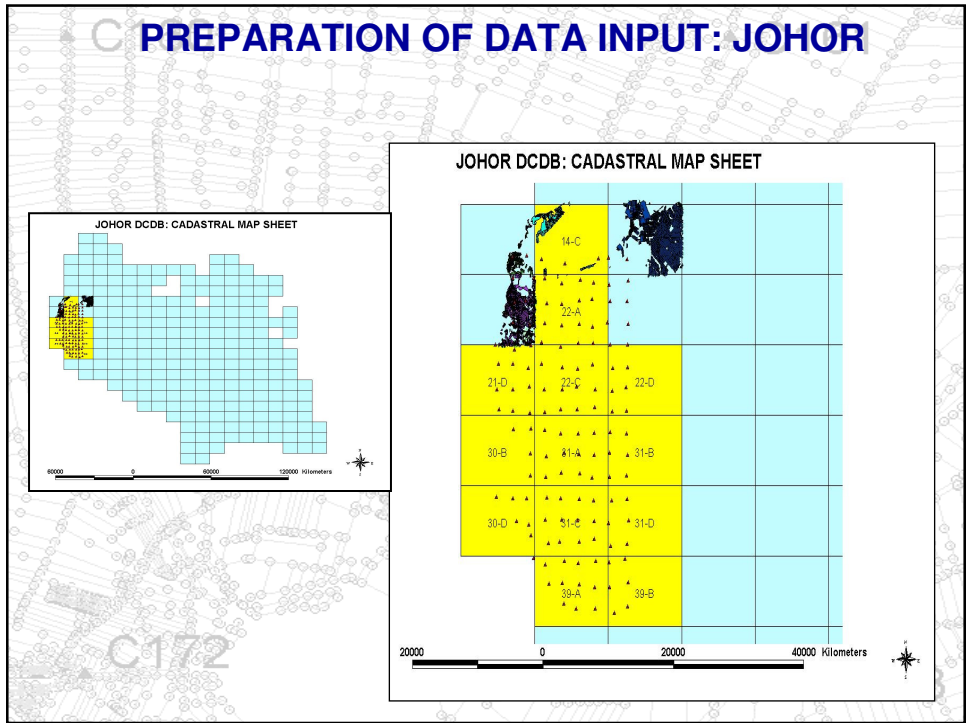


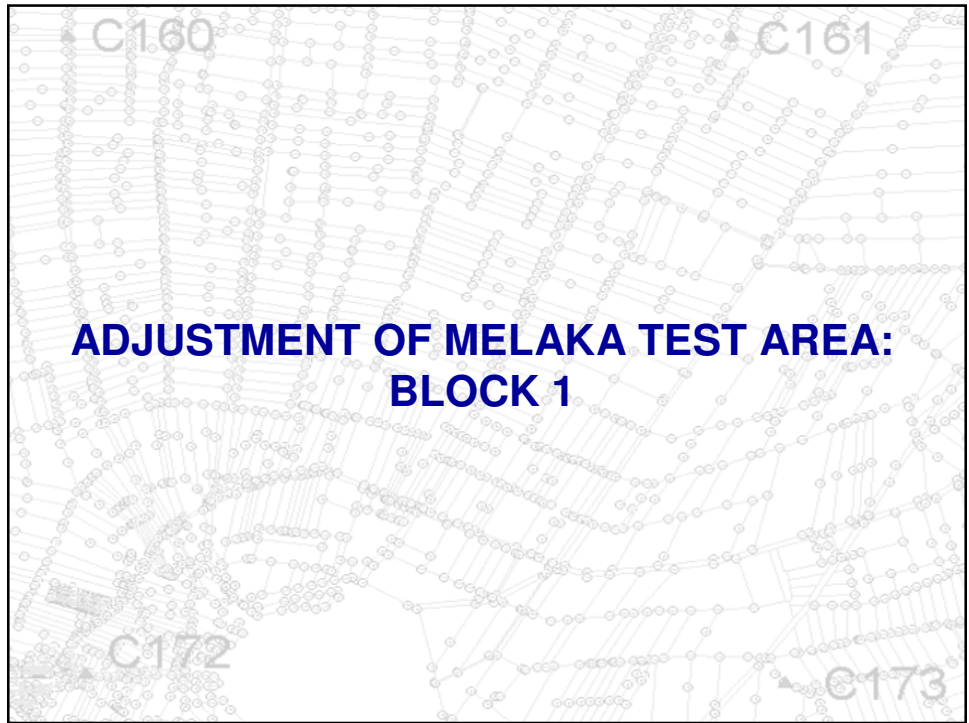
Total of Blocks: 24, block size ~ 2.5 km x 2.5 km



Total of Connection Lines: 4951

C PREPARATION OF DATA INPUT: JOHOR





The bottom-left screenshot displays a data table with the following columns: ID, CONNECTION, and TYPE. The table contains the following data:

ID	CONNECTION	TYPE
P00000	P00000	P
P00001	P00001	P
P00002	P00002	P
P00003	P00003	P
P00004	P00004	P
P00005	P00005	P
P00006	P00006	P
P00007	P00007	P
P00008	P00008	P
P00009	P00009	P
P00010	P00010	P
P00011	P00011	P
P00012	P00012	P
P00013	P00013	P
P00014	P00014	P
P00015	P00015	P
P00016	P00016	P
P00017	P00017	P
P00018	P00018	P
P00019	P00019	P
P00020	P00020	P
P00021	P00021	P
P00022	P00022	P
P00023	P00023	P
P00024	P00024	P
P00025	P00025	P
P00026	P00026	P
P00027	P00027	P
P00028	P00028	P
P00029	P00029	P
P00030	P00030	P
P00031	P00031	P
P00032	P00032	P
P00033	P00033	P
P00034	P00034	P
P00035	P00035	P
P00036	P00036	P
P00037	P00037	P
P00038	P00038	P
P00039	P00039	P
P00040	P00040	P
P00041	P00041	P
P00042	P00042	P
P00043	P00043	P
P00044	P00044	P
P00045	P00045	P
P00046	P00046	P
P00047	P00047	P
P00048	P00048	P
P00049	P00049	P
P00050	P00050	P
P00051	P00051	P
P00052	P00052	P
P00053	P00053	P
P00054	P00054	P
P00055	P00055	P
P00056	P00056	P
P00057	P00057	P
P00058	P00058	P
P00059	P00059	P
P00060	P00060	P
P00061	P00061	P
P00062	P00062	P
P00063	P00063	P
P00064	P00064	P
P00065	P00065	P
P00066	P00066	P
P00067	P00067	P
P00068	P00068	P
P00069	P00069	P
P00070	P00070	P
P00071	P00071	P
P00072	P00072	P
P00073	P00073	P
P00074	P00074	P
P00075	P00075	P
P00076	P00076	P
P00077	P00077	P
P00078	P00078	P
P00079	P00079	P
P00080	P00080	P
P00081	P00081	P
P00082	P00082	P
P00083	P00083	P
P00084	P00084	P
P00085	P00085	P
P00086	P00086	P
P00087	P00087	P
P00088	P00088	P
P00089	P00089	P
P00090	P00090	P
P00091	P00091	P
P00092	P00092	P
P00093	P00093	P
P00094	P00094	P
P00095	P00095	P
P00096	P00096	P
P00097	P00097	P
P00098	P00098	P
P00099	P00099	P
P00100	P00100	P

Statistical Summary for Adjustment: Block 1

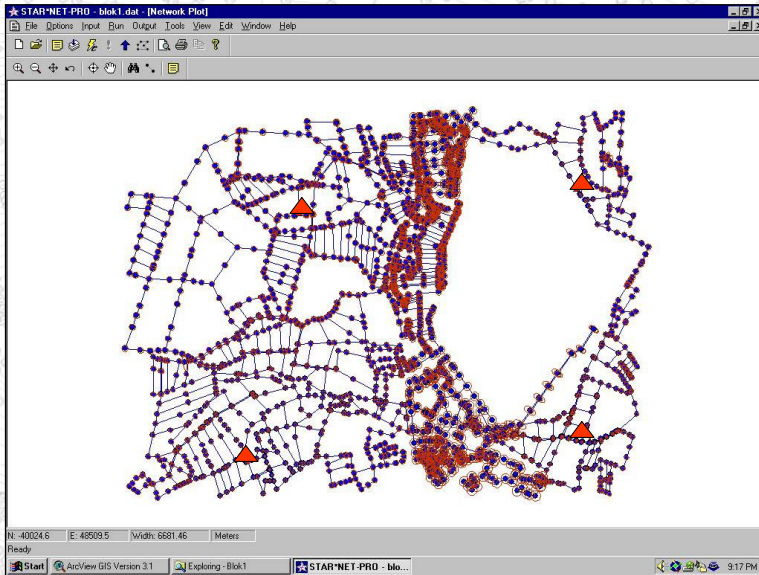
WGS-MRT-RSO-CASSINI

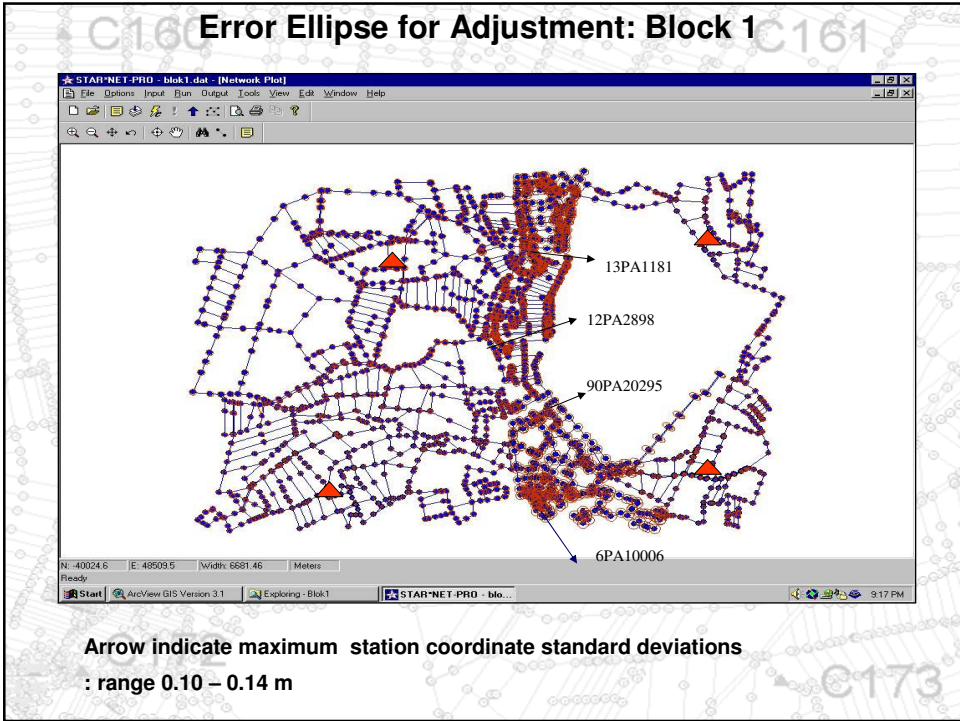
ADJUSTMENT 2001 (Fixed GPS Control Point at 2.5 km Interval) GPS Control Station: 16PA8052, 13PA20295, 34PA9268 and 15PA2128				
	Residual		Stn.Coord Std.Deviations	
	Bearing	Distance (m)	N (m)	E (m)
MAX	2'13"	0.080	0.142	0.141
MIN	-1'58"	-0.088	0	0
MEAN	-1"	0	-0.071	0.068
RMS	20"	0.008	0.075	0.072

Statistical Summary for adjustment Block 1

Number of Stations :2062
 Number of Observations :5036
 Number of Unknowns :4116
 Number of Redundant Obs. :920
 Error Factor :1.800 (Standard error factor = 1.00)

Error Ellipse for Adjustment: Block 1





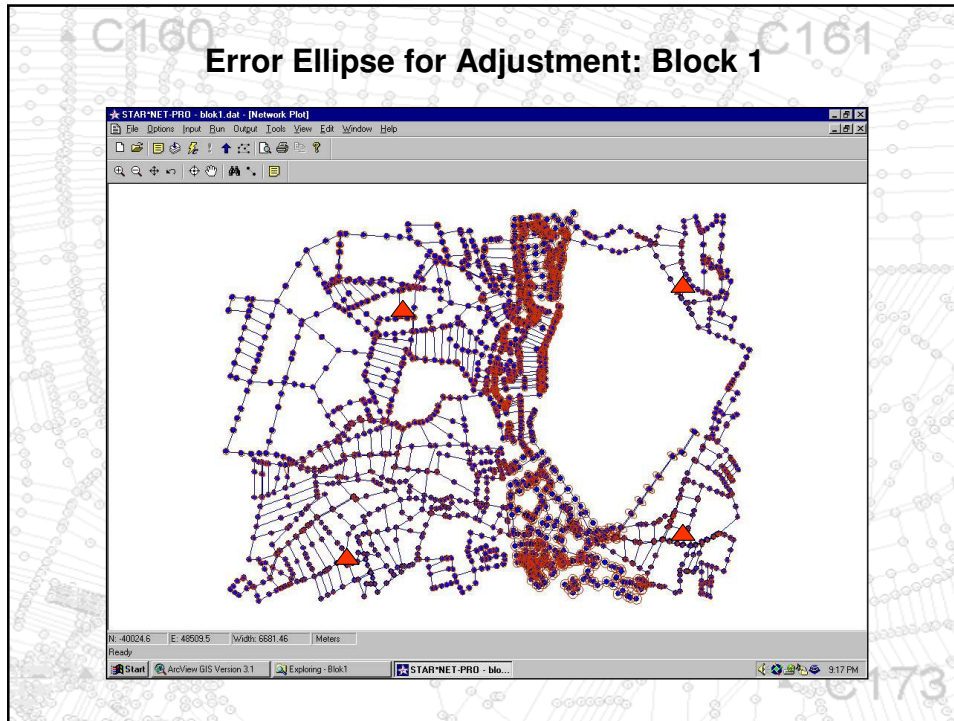
Statistical Summary for Adjustment: Block 1

WGS-CASSINI (GEOCENTRIC)

	ADJUSTMENT 2001 (Fixed GPS Control Point at 2.5 km Interval) GPS Control Station: 16PA8052, 13PA20295, 34PA9268 and 15PA2128			
	Residual		Stn.Coord Std.Deviations	
	Bearing	Distance (m)	N (m)	E (m)
MAX	2'01"	0.051	0.134	0.133
MIN	-1'48"	-0.060	0	0
MEAN	-1"	0	0.067	0.065
RMS	19"	0.008	0.071	0.068

Statistical Summary for adjustment Block 1

Number of Stations	:2062
Number of Observations	:5036
Number of Unknowns	:4116
Number of Redundant Obs.	:920
Error Factor	:1.693 (Standard error factor = 1.00)



- ### SUMMARY & ACTION TO BE TAKEN
- 1) Connection lines are needed in order to run the adjustment.
 - 2) Data integrity is the most important factor in the implementation of CCS.
 - 3) 2.5 km control station spacing is sufficient for rural area.
 - 4) Data integrity is needed before adjustment can be run. Data screening and cleaning is essential since attribute and spatial errors exist
 - 5) Focus on the adjustment and analysis of results: Blunder errors, connection lines, residuals and standard deviations
 - 6) Expected comprehensive adjustments results for study Melaka and Wilayah Persekutuan areas – end of July.
 - 7) Johor Test Area – end of August.
 - 8) Report writing and submission – end of October.